ATLAS
OF EMERGING
JOBS

3.0

AGENCY
FOR STRATEGIC
INITIATIVES

world**skills**
Russia

@ **mail.ru**
group

MTS

Альпина
ПАБЛИШЕР

It is now that the present is turning
into the future before our eyes.

ATLAS

OF EMERGING
JOBS

3.0

Edited by Dmitry Sudakov and Daria Varlamova
Translated by Amolingua Ltd.

DEAR FRIENDS,

The third edition of Atlas is the best. It is less romantic than the previous editions, but unlike many initiatives, Atlas has not turned into a state instrument but remained a public initiative.

In a world of coming uncertainty, this is particularly important: ordinary people can see and feel the future better than governments and corporations.

It is unlikely that at least one of Atlas's forecasts will come true 100 percent. Moreover, this is for the better! The task of parents and children planning the future together today is not to guess the right profession, but to realize that the future is too uncertain for accurate predictions. Being ready to face the unknown is a more difficult challenge. It requires not only knowledge and skills but also stress resilience, positive perception, and the ability to reflect and to accept risk. In essence, one will have to develop an "inner entrepreneur" as part of any profession.

Such an investment in risk is going to be the most justified investment in the future of professions. When reading the Atlas and trying on your next profession, think about how easily you could change it.

Probe the Atlas as early as possible and do not take your choices too seriously: it is important for teenagers to make many quick and cheap mistakes.

If you are a parent, letting your child take risks is very difficult; I know it as a father of two young children. I want reliability and safety. However, it is not going to be like that in real life.

Is why Atlas is about us and our future professions. Let's learn risk with the new generation, and let's succeed!

DMITRY PESKOV,
Head of «Young Professionals» area for promoting new projects in the Agency for Strategic Initiatives, Special Representative of the President of the Russian Federation on Digital and Technology Development

GOLDEN PARTNERS

DEAR FRIENDS AND COLLEAGUES,

The Atlas of Emerging Jobs 3.0 was published the same year as the 45th global professional competition WorldSkills Kazan 2019 was held. The motto of this ambitious international championship - Skills for the Future – echoes the spirit and the content of the project executed by the Atlas publishers.

WorldSkills Kazan 2019 illustrated that analyzing and forecasting in shaping future skills is currently one of the most promising areas in the system of vocational education both at the domestic level and worldwide. For the first time in the history of the World Skills movement, the program of the world championship embraced competitions in skills which are in demand in the era of high-tech production and the digital economy – Future Skills. The competition showcased how the skills and functions of a contemporary professional have evolved in the context of technological developments.

I am confident that the landscape of future skills has been and will be defined by digitalization penetrating rapidly into all spheres of activity to direct their development.

Robotization, on the one hand, is increasingly crowding out dying professions from the labor market, but at the same time, it is becoming a breeding ground for new competencies.

The restart of standardization approaches is also an important factor for shaping professions of the future: the reorientation from serial production to customization revives a whole cluster of professions. It is a totally new perspective for handicrafts, moreover the demand for unique original goods has an increasingly tangible impact on the specifics of the labour market.

The new edition of the Atlas reflects all these trends precisely, illustrating the rapid evolution of skills in its diversity. In contrast to previous editions, Atlas 3.0 is much more voluminous: not only standalone professions but entire industries have been added to it. I am sure that version 3.0 will be followed by version 4.0, 5.0, etc.

Let the publishers of the Atlas of Emerging Jobs enjoy the same enthusiasm and success in the development of such a promising and popular project. Let the readers think very carefully, what skills they want to master to rank high in the economy of the future.

ROBERT URAZOV,
Director General of WorldSkills Russia

Technology is swiftly becoming part of our lives and makes a reality what we only imagined yesterday. Everyday life objects are being replaced by innovative solutions which we already cannot live without. These changes generate new professions. Therefore, it's today that we have to understand what lies ahead and evolve accordingly, learn to adapt and obtain knowledge applicable in the future.

We know this firsthand. Currently, MTS is a digital company that promotes innovation in various areas – education, healthcare, finance, entertainment, etc. We develop solutions using state-of-the-art technologies, including big data, artificial intelligence, virtual and augmented reality. We are already creating professions of the future, fostering talent, and even retraining employees for new professions so that they remain in demand at MTS.

The Atlas of Emerging Jobs will indicate what industries are going to thrive and what specialists will be sought after by employers. In addition, it will help figure things out and select the right area of proficiency to invest your time and effort.

Maria Golyandrina,
Board Member, Vice President for HR, MTS

The world we live in is constantly changing. To remain sought-after and self-actualized, one should run several times faster than the job market. To do so, it is necessary to obtain relevant knowledge faster than your classmates, to master new skills faster than your peers, to introduce new technological solutions faster than your competitors. After all, everyone around you is competing with you all the time.

There are only two ways to be more successful than others to stay ahead.

First: you know exactly where to run and you have your own itinerary on the map. As far as your professional future is concerned, this map is the Atlas of Emerging Jobs, which you are holding in your hands right now.

Second: to explore an area that has not been mapped yet and become the one who will mark it for the followers. This will make you one of the next heroes of the Atlas.

Only 5 years ago in the IT-sphere, there were no specialties, for which today the demand is estimated at tens of thousands of jobs. Tomorrow new professions will appear at the interface of IT and other areas, and the number of such professions will be growing in the coming years.

BORIS DOBRODEEV,
CEO at Mail.ru Group

SILVER PARTNERS

NTI CLUBS MOVEMENT

is an all-Russian community of technology enthusiasts. The main focus of the Clubs Movement is bringing up the next generation of entrepreneurs, engineers, scientists, managers who are capable of conceiving and implementing projects, creating new solutions and technology companies aimed at the development of Russia and the world. To achieve this goal, a road map of the National Technology Initiative "Clubs Movement" was approved.

http://kruzhok.org/

TALENTS UNIVERSITY

is an education and communication platform initiated by Rustam Minnikhanov, President of the Tatarstan Republic, in 2015. It serves as a measure of state support and accompanies young people from the moment they win the competition to professional self-actualization.

https://utalents.ru/

ORBITA CAPITAL PARTNERS

is a venture capital management company. It manages the Digital Evolution Ventures fund.

The key areas of the fund include artificial intelligence, digital solutions in the industry, renewable and smart energy, 3D printing and new materials, smart and energy-efficient cities development systems. The fund invests in companies at an early stage and in the seed sector. The key parameters in selecting projects are the prospect of rapid growth and the potential for global technological expansion.

https://orbitacapital.com/

UHY YANS-AUDIT

is a Russian Group of companies, part of the UHY International network.

Since 2001, UHY YANS-Audit has been ranked consistently among the 25 largest audit and consulting companies in Russia. It provides a full range of audit and consulting services, including audit, tax, and legal consulting, valuation, and accounting outsourcing.

https://www.uhy-yans.ru/
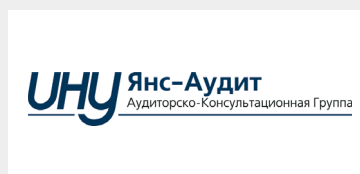
FORMATMIND.COM

explores the features of a person's work with information and the impact of these features on motivation, data processing, and decision-making speed. Based on the research, the company provides HR consulting for large brands, offers private testing of human thinking. Being aware of ones thinking format, a person is able to create a comfortable emotional and informational environment around him or her.

https://mindformat.ru/

MIND CLUBS

Control of one's own thinking is the literacy of the 21st century. "Mind Clubs" is a network of regional communities united by an interest in thinking development, solving intellectual problems, and forming a culture of thinking. The "Mind Clubs" implement unique network-based educational programs of the University 20.35 and its partners aimed to master the leading thinking schools and practices.

http://mindclubs.com

CONTENT

INTRODUCTION

Dear friends,

This is the third edition of the Atlas of Emerging Jobs. Since 2014, we have been talking about the changes in the world of professions and its future prospects. Over the years, the Atlas has grown up to be wiser; it has even been through thick and thin. However, the targets are the same: it aims to shed light on the near future, show the reader what jobs will look like in an ever-changing world, and perhaps help to find a business to your liking. The Atlas is not the authors' own fantasy. Thousands of first-rate experts contributed to its creation. They told us at special foresight sessions how the world of jobs is changing due to the global and domestic developments, and who they are—specialists of the future.

The world we begin to live in is a world of highest speed and turbulence. When choosing a future profession, it is much of a risk to be guided by what is popular now. In 5 to 10 years, when today's teenagers start working, the world will be a very different place. Some IT careers - for example, social media manager, professional blogger, iOS, and Android app developer - were not known in the early 2000s but now have become popular and well-paid. The Atlas reveals what kind of knowledge, skills, and abilities you need to have in order to be in demand as a specialist in the new world.

Remember, however, that this is not a blueprint for action, but a set of guidelines that you can use to build your own development trajectory.

We want to make the Atlas comprehensible and useful to its readers. We would therefore welcome your comments and suggestions on its further development. You can send them to atlas@atlas100.ru.

NAVIGATING THE ATLAS

The Atlas has several blocks and components:

APPLICATION GUIDANCE

A section for those who intend to work with young people contemplating career choices. In this part, we will explain how the world of professions is being transformed by big processes, what skills will be needed in the future, and how to talk to teenagers about the future, depending on whether you are a parent, a teacher, or a specialist in supplementary education.

CHAPTERS ON INDUSTRIES RANGING FROM TOURISM AND MASS MEDIA TO MINING

There are 27 industries in the current edition of the Atlas. These chapters consist of several components.

STORIES ABOUT NIKA

The new block that was not present in the previous editions of the Atlas is the story of a teenage girl Nika.

ASSIGNMENTS

Small assignments for the readers. Join the authors and describe one of the cases or come up with your own one. The best stories will be published on the website of the Atlas of Emerging Jobs, and the winner of the popular vote will receive a prize.

VISION OF FUTURE INDUSTRIES

A short description of how an industry will change, what new technologies will be adopted.

EMERGING JOBS

A description of the future occupations that may emerge in the next 5-15 years. In total, the book describes more than 300 professions.

CONCLUSION

in which we summarize the most important trends and provide leading questions that will help the reader to plan their future career.

We wish you the best of luck!

ATLAS OF EMERGING JOBS: APPLICATION GUIDANCE

The Atlas is primarily a book for teenagers; thus, any instruction will be out of place here. So, if you're a teenager, feel free to skip this piece and go to the most interesting part—page 44.

This section of the book is intended for those who are in one way or another associated with adolescents: for parents, school teachers, representatives of universities and clubs, for employers who are looking for motivated youth.

The Atlas of Emerging Jobs is a career guidance tool used today by thousands of clubs, schools, and higher education institutions across the country. It helps young people to start talking about the future, encourages them to explore new opportunities, and teaches them to build their educational and career trajectory consciously. Now, we want you to be as comfortable as possible in doing so. Okay, off we go.

1. ATLAS OF EMERGING JOBS: ITS AUTHORS, BACKGROUND, AND DESIGN OF THE FUTURE

When we talk about the Atlas of Emerging Jobs, we often encounter a literal interpretation of the book where the listed professions are perceived as the official register of future careers. This may cause rejection because the content of the Atlas looks very far from the modern language of professional standards, state educational standards, etc. It would be wrong, though, to take this book literally.

First of all, the Atlas is designed to encourage today's students or university entrants to think out of the box. This book aims to show that outside the familiar world of lawyers, economists, or marketing managers, there is a large world of professions, often more attractive. Ironically, the Atlas of Emerging Jobs describes the present day, where to start in order to build your path to a promising future.

The Atlas is not a set of ready-made recipes, but a way to understand the very structure of the labor market and the changes taking place in it. It is a career guidance tool which not only shows a wide range of industries and areas but also tells you why these areas appear and how to navigate them. It, therefore, opens new horizons for schoolchildren, parents, and people with occupations that are gradually becoming obsolete. After all, in order to become a top-notch professional in a few years, you need to have a clear idea of what you want to do in the future and what steps should be taken to arrive at the destination.

FOUNDERS
BIT OF HISTORY

The Atlas of Emerging Jobs dates back to 2010. At that time, it was a joint project of the Agency for Strategic Initiatives and the Moscow School of Management SKOLKOVO "Competence Foresight 2030". Within two years, the requirements for future specialists in the new economy were elaborated. The Atlas of Emerging Jobs was based on the findings of this large-scale research. In 2014, the first edition of the Atlas of Emerging Jobs was published:

DENIS KORICHIN, Partner in Designer of Practice Communities

EKATERINA LUKSHA, Leader of the Voice of Youth international project

Pavel Luksha, Professor of Practice at the Moscow School of Management SKOLKOVO, founder of the Global Education Futures initiative

Dmitry Peskov, Special Representative of the President on Digital and Technology Development, Head of «Young Professionals» Direction for promoting new projects in the Agency for Strategic Initiatives

The project would not have been possible without these people and institutions.

The Atlas was developing, and with the new team, it passed the second edition. It expanded the list of industries and introduced minor artistic details - diaries and chats of future specialists. This version, however, like the previous one, was rather designed for specialists in education. Teachers from different regions of the country based their career guidance lessons on the Atlas, and we created a set of career guidance games and scenarios to help them.

However, later we realized that it was time to talk directly to students about the future that waited for them. To do this, we created the current version written in a simpler and more understandable language, with storyline entries that plunge the reader into the amusing work days of new professionals.

FORESIGHT: SHALL WE HAVE A LOOK INTO THE FUTURE?

The content of the Atlas of Emerging Jobs was written in accordance with the Skills Technology Foresight methodology developed in Russia. It gained international recognition and was used, in particular, in cooperation projects with the World Bank and the International Labor Organization. Foresight is a social technology established abroad over forty years ago to be employed in business and public administration. This technology allows participants to jointly forecast the development of an industry, region, or country and, following this forecast, agree on activities to achieve the desired future.

Basic principles of the foresight are as follows.

- The future depends on the efforts made: it can be created.
- The future is variable: it does not simply result from the past but depends on its participants' and stakeholders' decisions.
- Some areas can be predicted, but in general, the future cannot be predicted accurately. We can prepare for the future as we want it to be, or we can shape it ourselves.

Guided by these principles, the Atlas of Emerging Jobs reveals the future that will emerge with the mutual effort of the leading companies in each industry. It is based on their development plan: entering new markets, launching new products, applying new technologies, and new ways of work organization. The Atlas is an essential part of shaping the desired future, as these development plans can only be realized if specialists are available to implement them. In a way, the Atlas of Emerging Jobs is a statement about the future that leaders of change in our country, such as development institutions, leading technology companies, and universities, are building together.

WHY IS THERE A NEED FOR A NEW APPROACH TO CAREER GUIDANCE?

For a long time, the usual educational cycle at school has been 10 to 11 years. Another four to six years are spent on vocational or higher education. That is, a person has about 15 years before he or she starts working. Half a century ago, the realities of social and economic development in the country allowed to predict the need for personnel for such a distant future: the process cycle was long, and state planning made it possible to schedule an order for necessary personnel for 15 or even more years ahead. That is why the education system fulfilled its main function effectively: it trained people so that graduates could easily find jobs (first of all, thanks to the distribution system).

Today, the world has changed, the pace of change and the level of uncertainty have increased to such an extent that few companies are able to predict what skills they will need even in a decade, let alone a more distant horizon.

At the same time, we see that specialized expertise is gradually becoming redundant as the technology to which such skills are attached is changing too rapidly. Nowadays, there is a demand for people who have knowledge of several industries and are capable of transferring knowledge and technological solutions from one industry to another. For example, 3D printing approaches, originally designed for quick prototyping, were later transferred by professionals to other industries: printing of buildings, medicines, human organs, and food.

Today's school students will enter the economy in five to seven years. The world will change significantly in that time. Expecting to become a manager, a lawyer, an economist, a PR specialist, or even a programmer, a student is oriented towards success in today's realities, but in the future, a different kind of expertise will be required. This is illustrated by the frustration of many young people who chose their career based on actual statistics of the demand for professions, and five or six years later realized that they had made a mistake. We want to help schoolchildren make more conscious choices that are driven by an understanding of their abilities and goals.

2. HOW THE ATLAS OF EMERGING JOBS WORKS

THE WEEKDAYS OF NEW PROFESSIONALS, AS SEEN BY A TEENAGER

To create an immersive experience and help students imagine future specialists' work, we have developed a series of stories about a teenage girl Nika who suddenly finds herself in 2035. Together with her robotic rabbit guide, she travels the world of professions from different sectors of the economy. Each chapter is devoted to a particular industry and begins with Nika's adventures. The girl joins a team of specialists who, with her help, solve their work tasks, which are very exciting and often suspenseful.

Nika is a typical teenager who is curious and anxious about the future. She still has a vague idea of who she wants to be and what this or that job consists in. The stories reveal not only new professions but also the way the workplace, technology, and work organization are changing. For example, it reveals that the majority of jobs in the future will require teamwork, an interaction of different specialists who complement each other. Meanwhile, the situations the heroine finds herself in are aimed to address the fears and doubts of modern teenagers.

Of course, we do not know for sure what the future specialists' work will look like. Nobody knows this. We have proposed rough scenarios based on technological forecasts and experts' opinions about the most important tasks of the future. Therefore, we have chosen the funniest and most unusual of possible situations so that teenagers would enjoy the reading.

ASSIGNMENTS

At the end of each story, you will find one or more actual cases similar to those solved by the experts in the story. There is a task in each case (for example, to put up a high-tech building in the desert promptly and with minimum impact on the environment). The reader has to figure out what kind of specialists from the Atlas are needed to complete this task, what tools they will use, what their workplace will look like, and write a short story about it. These creative assignments can be the first step in discussing with the teenager his or her professional future.

The stories can be sent to atlas30@atlas100.ru. We will publish the best stories on the website of the Atlas of Emerging Jobs, and the winner of the popular vote at the end of the year will receive a prize.

VISION OF FUTURE INDUSTRIES

Perhaps the most important part of the Atlas of Emerging Jobs is a description of what makes tomorrow's industry different from today's. This edition of the Atlas of Emerging Jobs features 27 sectors of the Russian economy. These visions of the future result from dozens of foresight sessions, which were attended by representatives of industries, authorities, and higher education institutions. During the sessions, they discussed how this or that industry would change, what technologies would enter it, and how the work organization would evolve.

EMERGING JOBS

The vision of the future can be used to suggest what kind of tasks the industry will face and what kind of specialists will solve these tasks. In this edition of the Atlas, there are more than 350 new professions, but these are just examples; in fact, there will be many more.

In the world of the future, the demand for uniform specialists will be shrinking, and the need for rare combinations of different competencies will be growing. Thus, if one can position him (or her) self as a carrier of a unique skill set, one will succeed in the world of tomorrow. At the same time, one should remember that almost all work will be teamwork, and one cannot rely on comprehensive versatility.

For each profession, experts have identified a set of the most important generic skills (we will talk about them in detail below). These skills are indicated by small icons.

EPILOGUE TO THE HEROINE'S ADVENTURES

After her travels, Nika returns to 2020 and faces the challenges of today. She reflects on her impressions and discusses with her friends and family what she can do now to become a successful and satisfied professional.

CONCLUSION

At the end of the book, we will tell you how the world of work is changing. The analysis is based on reports prepared by the Atlas team (e.g. Future Skills. What you need to know and be able to do in a new complex world.
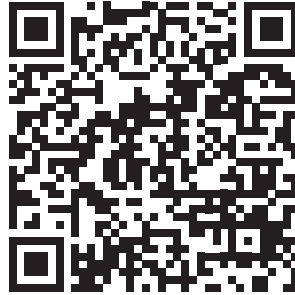
and a report by Boston Consulting Group "Russia 2025: Resetting the talent balance"

In conclusion, we show what global trends affect the labor market, how the demand for new professions is shaped, and why some of the existing professions are becoming obsolete and irrelevant. We also explain what this will mean for today's schoolchildren and what they can do now to be well prepared for the future.

By the end of the book, the reader will be able to gain insight into the details of specific industries, understand the general logic of changes in the labor market and draw up at least a basic action plan.

3. FROM SPECIALIZED EXPERTISE TO GENERIC SKILLS

Generic skills are a topic we wanted to emphasize in the Atlas. Their importance was first highlighted in the first edition of the Atlas of Emerging Jobs in 2014. Although the importance of these skills has now become apparent to those who work in education, teenagers, students, and often, their parents still have little idea what they are meant for.

The point is, professionals will acquire specific sets of skills in the future. These are often called the twenty-first-century skills. They will enable specialists to work more efficiently, to transfer between industries while maintaining their relevance.

The Atlas will shed light on the generic skills that are most valued by employers and lead to success in the future. Here they are.

MULTILINGUALISM AND MULTICULTURALISM

Even now, complex products such as computers or cars are produced by teams located in different countries. In the future, we will start working more and more in international offline and online teams. It will be important not only to be fluent in English but also to understand the national and cultural context of partner countries. In addition, it will be useful to know the specifics of your industry in other countries.

CROSS-INDUSTRY COMMUNICATION SKILLS

Many advanced products are produced at the intersection of different industries: IT and medicine, construction and nanotechnology, science, and art. Experts will therefore need to understand the technologies, processes, and market conditions in related and even non-related industries. The more diverse knowledge you have, the better chance you stand to be in demand.

CUSTOMER FOCUS

By the onset of the 21st century, it has become critical for companies to understand precisely the customer's needs and offer the perfect solution. In the future, the competition for a customer who is savvy and used to a large variety of services will only grow, so all employers will want to see the client-oriented staff. This primarily concerns the service sector; however, producers of goods will also strive to make the user experience as comfortable as possible.

PROJECT AND PROCESS MANAGEMENT SKILL

This skill will no longer be reserved for specially trained managers. Companies will move away from a strict hierarchy, so many professionals will need leadership skills, the ability to prioritize and select the right team.

OPERATING IN A HIGHLY UNCERTAIN AND FAST-MOVING ENVIRONMENT

In today's rapidly changing world, you will need to make quick decisions and respond to changes, allocate your resources effectively, and manage your time when information is incomplete. Resources also include the ability to control your state of mind, such as being able to concentrate on a specific task and to keep yourself calm in a stressful situation.

ARTISTIC CREATIVITY

There is a growing demand for personalized goods and services, as well as a growing need for non-standard solutions. Algorithms and automated solutions are not yet capable of replacing an artist (perhaps never will be). Therefore, employers will appreciate creative thinking and refined aesthetic taste.

ABILITY TO WORK IN TEAMS

We develop communication skills from infancy, and here a robot or a software cannot surpass us. The ability to communicate and interact productively when working together, to consider the

attitudes of others, and to resolve conflicts effectively are important skills that are so far only available to humans.

IT SOLUTIONS DEVELOPMENT / MANAGEMENT OF COMPLEX AUTOMATED SYSTEMS / WORK WITH ARTIFICIAL INTELLIGENCE

In some areas, it is useless to compete with machines. Still, you can become indispensable for the employer if you learn to customize the robots and artificial intelligence systems for the tasks chosen by man. At least, it is useful to master the basic level of programming—a standard set of computer literacy will soon be insufficient.

SYSTEMS THINKING

The world around us and the tasks we face are becoming more and more complex and require systems thinking—the ability to understand how complex systems are arranged, to see correlations, to find reasons, etc. People will be less likely to do one thing all their lives; more often, they will move from one project to another and even change their field of activity. To get involved in the work promptly, we will need to exercise systems thinking: to orientate in complex processes, mechanisms, or organizations and, if necessary, to translate our ideas into a language that colleagues from other industries can understand.

LEAN MANUFACTURING SKILLS

Lean manufacturing is an approach to process management based on a constant effort to cut all types of waste. This approach proclaims that each employee is involved in business optimization, while the business itself is focused on the consumer as much as possible. The lean production philosophy originates in Japan in the late 1980s and is now in demand among many global leading companies.

ENVIRONMENTAL THINKING

Ecological thinking includes taking care of the natural resources used (e.g. reducing energy consumption, water consumption, or natural raw materials) as well as reducing the amount of waste produced (recycling, use of biodegradable materials, etc.). The natural wealth is not infinite, and each of us bears responsibility for the place we live, be it a neighborhood or the entire planet.

The list of important generic skills of the XXI century is not limited to the mentioned above. Here are some of the other skills that man of the future will need.

ATTENTION MANAGEMENT

There is a constant and very aggressive struggle for our attention, and a person is easily distracted by a message on the phone, a video sent on the Internet, or an advertisement. To be effective and efficient in the bright world around us, we need to learn to identify the main thing from the information flow. Moreover, it is equally important to be able to concentrate on work and relax during leisure time.

CRITICAL THINKING

The volume of information around us is growing steadily, and not all of it is true and objective. To prevent manipulation, we must learn to distrust even reputable sources and to find confirmation or denial of the news or knowledge we receive.

AWARENESS

In order not to lose oneself in complex technologies and information flows, a person should well understand what he or she is doing at every moment of time. A good way to do this is to regularly answer the questions "What am I doing now?", "Why am I doing this?" Awareness of the focus of attention makes it easier to understand where our lives are taking us…

EMOTIONAL INTELLIGENCE

In a world full of technology, there is a growing demand for humanity; that is, something we will not be able to get from technology - human warmth, humor, and connection. At the same time, when due to technology, we will have more time to spend with our loved ones, we will badly need emotional intelligence - the ability to identify and recognize emotions, to empathize, to find a common language with another person, and to create a comfortable environment.

4. HOW CAN I USE THE ATLAS OF EMERGING JOBS IF I AM A...

...PARENT

The Atlas can be a nice starting point for talking to your child about their professional future. Read the book together, discuss what you have read, and search the internet for more information about what you are interested in. Help your child to complete one of the tasks suggested in the Atlas (depending on the industry they are most interested in).

Please note two things.

First, the choice of a teenager's first profession is largely influenced by the family, so you carry a great deal of responsibility.

Second, our knowledge of what will be in demand tomorrow is highly limited. Evidence suggests that the most successful people are those who are engaged in a business they enjoy. Try not to directly guide your child to the happiness, but explore together the options for their future career. Listen to their interests and help them.

Think together about the first steps your child could take towards a future that attracts them, what subjects need to be brushed up, and what to focus on. What kind of clubs they could attend, what kind of professional activities they could observe and perhaps try to perform (but remember that things can change a lot in 5-10 years when they start working!). Today there are little ready-made programs that would shape the specialists described in the Atlas. In the future, there will be few turnkey solutions. However, there are a lot of colleges and universities that could be the first step in this direction.

Discuss what generic skills a child will need to be a success at work and where they could learn them - our stories about Nika provide a lot of examples of how these generic skills can be developed, and for sure, you can come up with your own ways.

Think about what else you could read to develop and sustain a child's interest. Above all, it is key to listen to your child and trust them.

...SCHOOL TEACHER

The Atlas provides various assignments that can be discussed in class. Split the students into teams so they can try to complete them together (remember, in the future, they will have to collaborate, let them start now!)

The Atlas of Emerging Jobs is a tool for career guidance, but it is important to remember that career guidance is more than a single effort like a test or a tour of the company; it should be comprehensive. Think about how you could integrate the Atlas agenda into different lessons. Let's say, at geography lessons, you can discuss, what experts from the Atlas will be required in this or that region of Russia, at literature lessons, you can consider, what generic skills Eugene Onegin possessed, and what skills he might as well develop, at history - what kind of expert Oliver Cromwell could be if he lived in 2035.

In addition, the website of the Atlas provides practical cases of using the Atlas in varying contexts (games, lessons, or events). If you have designed your games and lessons that you would like to share, please send us an email at atlas30@atlas100.ru, and we will be happy to post them on the site.

Finally, we have developed the "World of Future Professions" kit, especially for schools. It is a set of career guidance lessons and games based on the Atlas of Emerging Jobs designed for systematic use in schools. Please see more information here: http://box.atlas100.ru/.

…CLUB

A club is crucial as a form of extracurricular activity. The Atlas of Emerging Jobs, in this case, can be a meaningful tool. Discuss within your team and with club members, what important skills your club helps to develop, what kind of future it is building.

The Atlas will be of use not only for technology clubs that are actively developing today in the sphere of robotics, programming, etc. Skills of the XXI century are developed through creative activities (dance improves creative thinking and emotional intelligence, and singing in a choir enhances teamwork) or chess (for systems thinking) or many other activities.

In addition to the book itself, you can use the given games and lessons developed from the content of the Atlas.

It is important to convey both to the child and parent that the club with its activities is not a "storage room" for the child, but an important and useful course for the future.

…COLLEGE OR UNIVERSITY

The modern education system in Russia is over-regulated and rather rigid. Nevertheless, it is important to be able to show your students the prospects that they may have if they enroll in a particular specialty or program.

Yes, today, the Russian vocational education does not train city-farmers and space geologists. But it is useful to discuss what kind of specialists from the Atlas graduates of your university or college may become in the future and what they will need to study extra.

In addition, you might think about how you could build on the existing programs to make them more relevant for the 21st century. Numerous universities and colleges today also hold activities and games based on the content of the Atlas of Emerging Jobs. You can find these in the section "If you are a school teacher".

…EMPLOYER

We understand that it is important for an employer to find specialists for existing vacancies, and often they have no time to think about the future. Nevertheless, the world is changing rapidly, and businesses will face two major challenges in the near future.

First, there will be a need to attract people with "new qualities". Those who can master new technologies and create innovations. According to the estimates made in Boston Consulting Group's report "Russia 2025: Resetting the talent balance", employers will need at least 4.5 million more of these people by 2025 (it is a tricky question, though, where to find them, and the answer lies, of course, in the sphere of cooperation between business and the system of education).

Second, there will be a need to retrain people of "obsolete jobs". The same BCG study estimates that over 9 million people could be unemployed by 2025.

The Atlas addresses both of these challenges. It can be used as a marketing tool that attracts motivated, talented young people with "new qualities": "No, we don't have the position that you liked in the Atlas so far, but you can join us for the available position, and you will gradually tailor the one you envisage.

It can also plant ideas for "risk groups" with "endangered professions". In the latter case, it is important to bear in mind that this edition of the Atlas of Emerging Jobs is written primarily for teenagers in the language of teenagers; hence there is need to adapt the content to an adult audience.

In addition, the information provided in the Atlas can help employers to determine their path to strategic transformation.

For example, the Chelyabinsk Pipe Rolling Plant is a good case study here. During the foresight session in 2017, participants identified the need for a new working position, which was called

"Repairman 2.0" (it is part of the Atlas "Industry" chapter), and in 2018 the company began training such specialists in one of its colleges. More detail about the foresight session can be found here:

...REGION

The region faces a number of important challenges related to the development of the regional economy, which is unthinkable without talented youth involved. The Atlas of Emerging Jobs describes the overall situation in the country, and an additional task for the region may include evaluating which sectors and industries from the Atlas are relevant for a particular territory. Therefore, if they manage to showcase fascinating images of the future and new professions in these sectors, it may significantly enhance the attractiveness of the region for young people.

Today there are already successful examples of such work, moreover, at the time of writing this text, the regional Atlas of Emerging Jobs of the Kaluga region has already been created, and the Atlas of Emerging Jobs of Bashkortostan is being formed.

5. COOPERATION AND DEVELOPMENT

The team of the Atlas of Emerging Jobs never ceases to move forward. We develop the project, create games, assist in developing regional Atlases of Emerging Jobs, conduct foresight sessions, train teachers, etc.

If you wish to contribute to the project development, please write to the project manager, Dmitry Sudakov: sudakov@atlas100.ru.

1 Systems thinking

2 Cross-industry communication skills

3 Project management

4 Lean production

5 IT

6 Customer focus

7 Multilingualism/ Multiculturalism

8 Social skills

9 Working in uncertainty

10 Art and Creativity

11 Ecological thinking

CROSS-PROFESSIONAL SKILLS IN THE EMERGING JOBS

	1	2	3	4	5	6	7	8	9	10	11
MEDICINE											
Bioethicist	✓					✓	✓	✓	✓		
Genetic consultant	✓				✓	✓					
Clinical bioinformaticist	✓				✓		✓		✓		
Health R&D Manager	✓	✓	✓			✓	✓				
Molecular nutritionist	✓					✓					✓
Medical robot operator	✓				✓		✓				
IT geneticist	✓				✓		✓				
Developer of cyber prosthetics and implants	✓	✓	✓	✓	✓		✓				✓
Tissue engineer	✓	✓	✓		✓						
Medical institution lifecycle planner	✓		✓	✓		✓		✓			
Personified medicine expert	✓				✓	✓	✓	✓			
Healthy aging consultant	✓		✓			✓	✓	✓		✓	
Online GP	✓				✓	✓	✓	✓			
Translational medicine specialist		✓	✓			✓		✓			
Targeted nanotechnologist		✓			✓		✓		✓		
Pharmacological ecologist	✓		✓			✓					✓
Medical marketer	✓	✓				✓	✓	✓			
IT medical worker	✓		✓		✓		✓				
Medical equipment architect	✓	✓	✓		✓	✓	✓				✓
MEDIA AND ENTERTAINMENT											
Architect of virtuality	✓	✓	✓		✓	✓					

Emotion designer	✓	✓				✓		✓		✓	
Producer of the semantic field (or "semanticist")	✓				✓	✓	✓	✓	✓		
Gamification expert in mixed reality						✓	✓	✓		✓	
Media policeman								✓	✓		
Media software developer	✓	✓			✓	✓		✓			
Infostylist					✓	✓	✓	✓			
Fact checker	✓	✓						✓	✓		
Content aggregator editor			✓		✓	✓	✓	✓			
Creative neural network curator	✓		✓		✓					✓	
Smart advertising designer		✓	✓					✓		✓	
Contextual game developer	✓	✓				✓		✓		✓	
Screenwriter of interactive movies / TV series	✓	✓			✓				✓	✓	
Private content maker					✓			✓	✓	✓	
Transmedia content architect	✓	✓	✓		✓	✓	✓			✓	
Virtual world designer	✓				✓	✓	✓			✓	✓

TOURISM AND HOSPITALITY

Smart travel systems developer			✓		✓	✓					
Tour navigator developer					✓	✓	✓				
Robotics supervisor			✓		✓	✓	✓				
Curator of conscious ecotourism	✓					✓		✓		✓	✓
Family travel writer	✓	✓				✓		✓		✓	
Educational travel curator	✓					✓		✓		✓	
Intercultural communication coach for tour guides		✓					✓	✓	✓		
Gamificator of tourist experience	✓		✓		✓	✓		✓		✓	
Territory AR designer					✓	✓	✓			✓	
Territory architect		✓	✓		✓	✓	✓	✓		✓	

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Individual tour scriptwriter						✓	✓	✓		✓	
Territory brand manager	✓		✓			✓	✓	✓		✓	
INDUSTRY											
Tech-mediator	✓	✓	✓		✓		✓	✓			
Cyber physical systems designer			✓		✓	✓				✓	
Designer of new materials and technologies	✓	✓			✓						✓
Cybersystem manager				✓	✓				✓		
Repairman 2.0		✓						✓	✓		
Equipment failure forecaster	✓	✓			✓				✓		
Digital modeling engineer	✓		✓		✓			✓			✓
Industrial flow logistics specialist	✓	✓			✓			✓			
Industrial robot operator				✓	✓						✓
Additive technology machine operator		✓	✓	✓	✓						✓
Digital artisan		✓				✓				✓	
Industrial robotics designer	✓	✓	✓	✓	✓						✓
Operator of multifunctional robotic systems	✓				✓				✓		✓
FASHION											
Clothing recycling specialist	✓			✓							✓
Healthy clothing expert						✓		✓			✓
Smart fabric designer		✓	✓		✓	✓					
Tech stylist		✓			✓	✓				✓	✓
New organic materials designer		✓			✓	✓		✓		✓	✓
Fashion visual effects specialist						✓		✓		✓	✓
Smart clothing repairman					✓	✓			✓		
Brand blockchain authentication expert	✓		✓		✓						
Fashion expert on environmental safety	✓					✓					✓

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Light industry IT-interface developer		✓	✓		✓						
Developer of electronic recipes of clothes		✓		✓	✓					✓	
CONSTRUCTION											
Eco-analyst in construction	✓	✓			✓						✓
3D printing engineer in construction	✓	✓	✓	✓	✓	✓					✓
Redevelopment specialist for industrial areas	✓		✓		✓			✓		✓	✓
Building technology modernization specialist	✓	✓	✓	✓							✓
Specialist in the development of new materials for construction	✓	✓	✓								✓
Zero energy buildings architect	✓	✓	✓	✓		✓				✓	✓
Accessible environment designer				✓		✓		✓		✓	
Foreman watcher	✓	✓	✓	✓	✓			✓			
Specialist in rebuilding and reinforcing old buildings	✓	✓	✓	✓	✓				✓		✓
Smart home Infrastructure designer	✓	✓	✓		✓	✓					
Urban lifecycle manager	✓		✓			✓				✓	✓
BIM manager	✓	✓	✓	✓	✓						✓
FINANCIAL SECTOR											
Personal retirement plan developer	✓		✓		✓						
Crowdfunding and crowd equity platform manager	✓		✓		✓	✓	✓				
Developer of automated services for managing personal finances			✓		✓	✓		✓			
Machine-to-Machine algorithm (M2M) transaction architect	✓		✓		✓	✓	✓				
Financial sector cybersecurity analyst	✓	✓			✓			✓			
Distributed ledger architect	✓	✓			✓	✓				✓	
Distributed ledger developer			✓		✓					✓	
Intellectual property evaluator	✓	✓	✓		✓		✓				
Green finance auditor	✓		✓					✓			✓
Multicurrency converter	✓				✓	✓	✓				

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Private equity fund manager for talented people	✓		✓		✓	✓	✓				
Individual financial trajectory designer	✓		✓		✓	✓	✓				
BIOTECHNOLOGIES											
Developer of biocompatible and biodegradable materials	✓		✓		✓		✓				✓
System biotechnologist	✓	✓	✓	✓	✓	✓					✓
MFC developer	✓	✓	✓	✓							✓
Biochemical engineer	✓	✓		✓	✓				✓		✓
Safety engineer in a biotechnological production	✓	✓						✓	✓		✓
Synthetic biologist	✓	✓				✓				✓	✓
Living systems architect	✓	✓	✓	✓	✓	✓	✓				✓
Biopharmacologist	✓	✓	✓		✓	✓					
SAFETY											
Business continuity manager	✓		✓		✓			✓			
Ergonomic designer of wearable security devices			✓		✓	✓				✓	
Personal security designer	✓				✓	✓		✓	✓		
Remote security coordinator	✓				✓				✓		
Integrated security auditor in industry	✓				✓			✓	✓		
Personal profile security advisor	✓				✓	✓		✓			
Child psychological safety specialist	✓	✓	✓		✓	✓	✓				
IT SECTOR											
Digital office architect	✓	✓			✓	✓		✓		✓	
Dataset collector	✓				✓						
Data quality verification specialist	✓		✓		✓		✓				
Big data model developer	✓	✓	✓		✓	✓					
Privacy balancer					✓	✓		✓	✓		
Hardware developer for AR / VR solutions	✓	✓	✓		✓					✓	

	1	2	3	4	5	6	7	8	9	10	11
Quantum computer programmer	✓				✓				✓		
Neural network controller	✓		✓		✓		✓				
Interface designer	✓	✓			✓			✓			
Information ecologist					✓		✓	✓			✓
User experience designer (UX)	✓				✓	✓	✓			✓	
Neural interface programmer		✓	✓		✓					✓	
Cyber technician for smart environments	✓				✓				✓		
Information security curator	✓		✓		✓				✓		
Immersive design specialist	✓				✓	✓	✓			✓	✓
Cyber investigator	✓				✓		✓	✓			
Digital linguist	✓	✓			✓	✓	✓				
Technology evangelist			✓		✓	✓	✓	✓			
IT auditor	✓				✓	✓		✓	✓		
Online lawyer	✓				✓	✓	✓				
Information systems architect	✓	✓	✓		✓	✓					
LAND TRANSPORT											
Transport network security engineer	✓	✓	✓		✓		✓	✓	✓		✓
Transport system modernization specialist	✓		✓	✓					✓		✓
Telematics developer		✓	✓		✓		✓				
Intelligent management architect	✓	✓	✓	✓	✓						
Intermodal transport hub designer					✓	✓	✓		✓		
Smart road builder			✓	✓	✓						✓
Designer of transport composite constructions	✓	✓	✓	✓	✓						✓
High-speed railways designer	✓	✓	✓	✓	✓						✓
Intermodal transport solution designer	✓	✓	✓	✓	✓		✓				✓
Cross logistics operator	✓		✓	✓		✓	✓	✓	✓		

	1	2	3	4	5	6	7	8	9	10	11
Operator-analyst of transport solutions	✓	✓			✓				✓		
Operator of automated transport systems	✓			✓	✓				✓		
ECOLOGY											
Ecologist logistician		✓	✓		✓						✓
Specialist in overcoming systemic environmental disaster	✓	✓	✓		✓			✓	✓		✓
Specialist in carbon markets	✓	✓			✓			✓	✓		✓
Climate risk insurance specialist	✓		✓			✓		✓			✓
Ecosystem services auditor	✓	✓		✓	✓						✓
Eco producer		✓				✓	✓	✓		✓	✓
Software developer for environmental protection		✓	✓		✓						✓
Zero waste manager	✓		✓			✓		✓			✓
Manufacturer environmental responsibility consultant	✓		✓			✓		✓			✓
Bioremediator		✓	✓	✓					✓		✓
Ecosystem restoration architect	✓	✓	✓				✓	✓			✓
Park ecologist	✓	✓	✓				✓	✓			✓
Ecologist urbanist	✓	✓		✓	✓		✓	✓			✓
Rehabilitation veterinarian		✓				✓		✓			✓
Agricultural ecologist	✓	✓									✓
FOOD INDUSTRY											
Food safety curator	✓	✓							✓		✓
Enriched food designer	✓			✓		✓				✓	
Synthetic animal product developer		✓	✓								✓
Food production algorithms developer	✓		✓	✓	✓						✓
Food logistics specialist	✓	✓					✓				✓
Fast food robot developer			✓	✓	✓	✓	✓				
Advisor in harmful ingredient replacement	✓	✓				✓		✓			✓

	1	2	3	4	5	6	7	8	9	10	11
Food recycling specialist	✓			✓			✓				✓
Food rationalizer	✓		✓		✓						✓
Neurogastronomist	✓				✓	✓		✓		✓	
IT nutritionist	✓				✓	✓	✓				
Gamifier of healthy eating habits					✓		✓			✓	✓
Ecological nutritionist					✓		✓				✓
SOCIAL SPHERE											
Eco-guide	✓		✓			✓	✓				✓
Social conflict mediator	✓					✓	✓	✓			
Specialist in the organization of public-private partnerships in the social sphere	✓	✓	✓		✓	✓	✓				
Platform moderator for personal charity programs			✓		✓	✓	✓				
Migrant adaptation specialist					✓	✓	✓				
Community crowdsourcing specialist			✓		✓	✓	✓				
Social worker on adaptation of people with disabilities via the internet			✓		✓	✓			✓		
Platform moderator for communication with government agencies			✓			✓	✓				
Corporate social responsibility consultant		✓	✓			✓	✓				✓
Assistant technology implementation specialist	✓	✓				✓	✓			✓	
Crisis center manager		✓				✓	✓	✓	✓		
Developer of sharing platforms	✓	✓			✓	✓	✓				
Moderator of sharing platforms		✓				✓	✓	✓		✓	
Volunteer group curator					✓			✓	✓		
Personal ethical consumption advisor	✓	✓		✓			✓				✓
ROBOTICS											
Home robot designer	✓	✓	✓		✓	✓					
Medical robot designer	✓	✓	✓		✓						
Robot control neural interface designer	✓		✓		✓			✓			

	1	2	3	4	5	6	7	8	9	10	11
Children's robotics designer	✓	✓	✓		✓	✓		✓		✓	
Composites engineer	✓	✓			✓						
Ergonomic designer	✓	✓	✓		✓			✓			
Nanobot developer	✓		✓		✓		✓				
Smart swarm programmer	✓	✓			✓				✓	✓	
Roboethics consultant	✓				✓	✓		✓		✓	
AVIATION											
Aeronautics infrastructure designer	✓	✓	✓	✓	✓		✓				✓
Aircraft recycling technologist	✓	✓	✓	✓							✓
Unmanned aircraft interface designer	✓		✓		✓	✓	✓				
Airship designer	✓	✓	✓	✓	✓						
Performance analyst	✓				✓						
Small aviation production engineer	✓		✓	✓	✓	✓					✓
Repairman-composer				✓	✓			✓			
Digital modeling specialist	✓		✓		✓		✓			✓	
Load optimization engineer	✓		✓	✓	✓		✓				
Intelligent dispatch system developer	✓		✓		✓						
Drone adjuster			✓		✓			✓			
WATER TRANSPORT											
Arctic navigation expert	✓		✓				✓	✓			
Marine infrastructure systems engineer	✓	✓	✓		✓						✓
Port ecologist	✓	✓			✓		✓				✓
Designer of marine robots			✓		✓	✓				✓	
Marine robot repairman				✓	✓	✓		✓			
Developer of automatic ship navigation systems	✓	✓			✓		✓				✓
Energy-efficient ship designer	✓	✓	✓		✓						✓

	1	2	3	4	5	6	7	8	9	10	11
Unmanned water transport manager	✓	✓			✓				✓		
Cyber tech engineer of underwater internet of things		✓		✓	✓		✓		✓		
Underwater power designer	✓	✓	✓		✓						✓
NEW MATERIALS AND NANOTECHNOLOGIES											
Biomimetic	✓	✓	✓					✓		✓	✓
Security specialist in nanoindustry	✓	✓			✓		✓		✓		
Smart materials designer	✓	✓	✓		✓	✓	✓			✓	
Glazier	✓		✓	✓							
Recycling technologist	✓	✓	✓	✓	✓						✓
Nanotechnology designer	✓		✓		✓		✓				
Composite systems engineer	✓	✓	✓			✓	✓				✓
Translational nanotechnologist		✓	✓			✓		✓	✓		
Constructor of micro- and nanoelectronics	✓	✓		✓	✓		✓				
Sensor designer	✓	✓			✓		✓			✓	
Diagnostic systems engineer	✓	✓		✓			✓		✓		
POWER INDUSTRY											
Smart wearables designer	✓	✓	✓		✓	✓	✓	✓		✓	
Meteopower specialist	✓	✓			✓						
Local power systems specialist	✓	✓	✓	✓	✓						✓
Energy storage designer	✓		✓	✓	✓						✓
Recuperation systems designer	✓	✓	✓	✓	✓						✓
Microgeneration systems developer	✓	✓	✓	✓	✓	✓	✓				
Hydrogen energy designer		✓	✓		✓		✓				
Energy generation systems modernizer	✓	✓	✓	✓			✓				✓
Energy consumption systems developer	✓		✓	✓		✓					✓
Intelligent power systems engineer	✓	✓	✓	✓	✓		✓				✓

Energy auditor	✓			✓		✓					✓
Distributor / Network controller for distributed energy	✓			✓	✓						✓
Powermarketer	✓	✓				✓	✓	✓			
Electricity consumer advocate	✓					✓	✓	✓	✓		
Electric vehicles charger				✓		✓					
AGRICULTURE											
Agricultural economist	✓		✓		✓				✓		✓
Agricultural nutritionist	✓					✓		✓			
Automated farm operator				✓	✓						✓
City farmer	✓	✓	✓			✓	✓				✓
GMO agronomist	✓	✓	✓	✓	✓	✓	✓				✓
Agroinformatics specialist / Agrocyberneticist	✓	✓	✓		✓						✓
Online veterinarian						✓		✓	✓		✓
Digital agri-model developer	✓	✓			✓		✓				✓
MINING											
Coordinator of distributed tunnelling teams	✓		✓	✓				✓			
Exploration UAV operator					✓				✓		✓
Robotic systems engineer	✓	✓			✓						✓
Telemetry data interpretation engineer	✓								✓		
Mining system engineer	✓	✓	✓	✓							✓
IT geologist			✓		✓		✓		✓		
Smart field systems constructor	✓	✓	✓		✓		✓				
EOR implementation engineer			✓	✓	✓	✓		✓			
Deep-sea geologist			✓	✓	✓		✓		✓		
Environmental analyst in extractive industries	✓	✓	✓		✓				✓		✓
LNG equipment operator			✓	✓	✓			✓			

	1	2	3	4	5	6	7	8	9	10	11
SPACE											
Spaceport engineer	✓				✓		✓		✓		✓
Astrogeologist	✓		✓	✓	✓		✓		✓		
Life support systems engineer	✓			✓	✓		✓				
Astrobiologist	✓	✓	✓		✓		✓				
Space tourism manager			✓			✓	✓	✓			
Space constructions lifecycle designer	✓	✓	✓	✓	✓		✓				✓
Research equipment designer	✓	✓			✓		✓	✓			
Space garbage collector	✓		✓		✓				✓		✓
Communication appliance developer	✓	✓			✓		✓	✓			
Space lawyer	✓	✓				✓	✓		✓		
Space power engineer	✓	✓			✓		✓				✓
Space smart control architect	✓	✓			✓	✓	✓	✓			
Operator processing Earth images from space			✓	✓	✓						
Space production engineer	✓	✓	✓	✓			✓			✓	✓
NEURONET											
Mind fitness trainer	✓	✓	✓		✓	✓		✓			
Neural rehabilitologist		✓			✓	✓			✓	✓	
Neuropharmacologist		✓	✓	✓			✓				✓
Neuromarketologist	✓	✓				✓	✓	✓			
Neural interface designer	✓	✓	✓		✓		✓				
Consciousness tools developer	✓	✓	✓		✓	✓		✓			
MANAGEMENT											
Coordinator of community development programs	✓	✓	✓				✓	✓		✓	
Coordinator of production in distributed communities	✓	✓	✓	✓		✓	✓	✓			
Online sales manager	✓		✓		✓	✓		✓			

	1	2	3	4	5	6	7	8	9	10	11
Personal brand manager						✓	✓	✓		✓	
Corporate anthropologist	✓					✓	✓	✓			
Cross-cultural communication manager	✓	✓				✓	✓	✓			
Corporate venture fund portfolio manager	✓	✓	✓				✓	✓			
User community moderator	✓		✓		✓	✓	✓	✓			
Online lawyer						✓	✓	✓			
Foresighter/Trend watcher	✓	✓	✓			✓	✓				
Time manager	✓					✓	✓	✓			
Time broker		✓				✓	✓	✓			
Inventive problem-solving consultant	✓	✓		✓				✓	✓		
Business processes schematizer	✓	✓	✓			✓	✓			✓	
Facilitator		✓	✓			✓		✓		✓	
Human-machine team manager			✓		✓	✓	✓			✓	
Sustainability consultant	✓		✓	✓		✓		✓			✓
Staff cognitive work optimizer	✓					✓	✓	✓	✓		
Designer of markets/industries	✓	✓				✓	✓		✓	✓	
Producer of industry-specific coworking space		✓	✓			✓		✓		✓	
Children's R&D manager	✓	✓	✓			✓		✓		✓	
Experience manager	✓	✓				✓	✓	✓		✓	
Ecoauditor	✓	✓	✓					✓			✓
HR gamifier	✓							✓	✓	✓	✓
HR developer		✓				✓	✓	✓			
METALLURGY											
New metals designer	✓		✓		✓						
Ecorecycler in metallurgy	✓	✓							✓		✓
Equipment supervisor	✓			✓	✓						✓

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
System equipment modernizer	✓	✓		✓			✓				✓
IT metallurgist		✓	✓		✓		✓				
Biometallurgist	✓	✓					✓				✓
Electronic waste recycler		✓				✓	✓				✓
New metals advisor	✓	✓				✓	✓				
Powder metallurgy designer	✓	✓	✓	✓	✓						✓

CULTURE AND ART

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Art appraiser	✓					✓	✓	✓		✓	
Science artist		✓	✓				✓			✓	
Personal tutor on aesthetic development	✓	✓				✓	✓	✓			
Creative state trainer						✓	✓		✓	✓	
Curator of collective creativity		✓	✓				✓	✓		✓	
Art technologist		✓	✓		✓		✓			✓	
Curator of human-machine creativity	✓	✓			✓	✓				✓	
Virtual museum curator		✓			✓	✓	✓			✓	
Mobile art guide developer			✓		✓	✓	✓				
Interactive books publisher	✓		✓				✓	✓			
Concept artist in computer games		✓			✓	✓				✓	

EDUCATION

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Educational trajectory developer	✓	✓	✓		✓	✓		✓		✓	
Career strategist	✓	✓				✓	✓	✓	✓		
Project-based learning organizer	✓	✓	✓			✓		✓		✓	
Tutor	✓	✓	✓			✓		✓			
Game master	✓	✓					✓	✓		✓	
Moderator	✓	✓	✓					✓		✓	
Educational content unpacker / packer	✓		✓			✓				✓	

	1	2	3	4	5	6	7	8	9	10	11
Online education platform coordinator	✓	✓	✓		✓		✓	✓			
Team competencies trainer	✓		✓			✓	✓	✓			
Educational ecosystems architect	✓	✓	✓				✓	✓		✓	✓
Educational institution modernizer	✓	✓		✓		✓				✓	
Knowledge validator		✓	✓				✓	✓			
Child future life advisor	✓		✓			✓	✓	✓			
Startup mentor	✓	✓	✓		✓	✓	✓				
Environmental prophet	✓	✓	✓					✓			✓
Games educator	✓	✓					✓	✓		✓	

Finance and law

PREFACE TO THE NARRATIVE

— Come on, hurry up. It's already started. And don't make such a tragic face—Mom grinned. — Look what a beautiful day it is.

— I'm not going to be a lawyer anyway, why should I listen to this boring stuff?—Nika rolled her eyes again. She and her parents were walking down a shady alley. The sun was flickering in the foliage. The air was filled with the smell of freshly mowed lawn and bird-cherries. It is a summer vacation. Freedom… But the day was already ruined. Life can be hard when you are sixteen…

— It's only an open day, — Dad remarked. — And you have another year to think, to make an informed decision…

— I've made up my mind, — Nika stuck to it. — I'm going to be an actress. Or a director.
Mom and Dad looked at each other.

— Well, of course, — Mom's lips turned into a crooked smile. — And a rock star, too. Everyone's just waiting for you.

— Well, thank you for believing in me!—Nika got furious. — By the way, Kostya is also going to enter an acting school and his parents…

— And if he joins the army, will you go with him, too?—Mom raised her eyebrows.

— Look, mouse, we are taking care of you. This Kostya has been in acting clubs since he was eight years old… He spends all his free time in theaters. When did you last see a play? A lawyer is a popular and reliable profession, — Dad said. — Uncle Sasha is a lawyer, take a lesson from him.

— But you're both teachers, yourselves, — Nika remarked.

— Our salaries are ridiculous! But Uncle Sasha…

— Money is not everything!—Nika kicked a pebble. — What if I want to express myself?

— As a director or an actress, though?—Dad smiled. — I think we're there.

The university was looming ahead—a heavy building with columns, typical of Stalin Empire style. Flocks of teenagers and their parents were streaming down to it. Nika had little resemblance to a future lawyer anyway—silver sneakers, a T-shirt with Doctor Who, but before entering the building, she decided to highlight that she did not belong here among these bores. She made her short hair messy, smeared her lips with bright lipstick. Mom gave a sigh.

— You did it on purpose, didn't you?

Nika shrugged. She felt sad and angry and somewhat anxious. She's about to start living on her own, but the adult world seemed ambiguous so far. On the one hand, people invented and designed space rockets, went to breathtakingly beautiful festivals like Burning Man, made round-the-world trips, and did other exciting things. On the other hand, most of the adults that Nika met lived a depressing life, and all they did at work was sorting out documents and going to boring meetings. It looked as if there were two different breeds of adults. Nika wanted to belong to the

first breed but didn't know how to test it or if she can know in advance. And if she can't, how can she join this category? Is there some kind of test for coolness? And where do they pass it?

Unlike her, Mom approached the meeting with a sense of responsibility. She wore her favorite tweed jacket and even curled her hair. Dad had to wear a shirt to keep up, too. It was weird for Nika because the open day was meant for her, not her parents. What's the occasion to be dressed up, after all?

The law school didn't look any better from inside than it did from outside—an old building with echoing corridors painted pale yellow. The foyer, understandably, also had columns and banners on the walls saying—"Open Day—2020", "Welcome to the Legal Department!".

— Hello, Kolya!—she heard a girl's voice ringing. — Are you there, too? What brings you here?

Nika looked back at the owner of the voice and saw a tall girl in a sweatshirt that said "Goddess".

— Oh, Mashka! Sure, you're here! My folks graduated from this faculty. I thought you were going to enter the psychology department…

— Yeah, but a master's degree in law is kind of more hip. Above all, it is easier to pass social studies than biology.

"Am gonna hang out with someone like that for a few years? Well, that's great," Nika thought. In the meantime, Mom dragged everyone to the schedule on the wall.

— The faculty presentation is in the auditorium. It started ten minutes ago.

Nika was reluctant to follow her. Dad was walking with an important and, at the same time, a stoic expression on his face as if he didn't like it much, but adults have to do what they have to do.

There was a kind of long grandstand on the stage of the auditorium. Five people in jackets were sitting there. A woman with her hair in a tight bundle was speaking solemnly, peeking at a paper:

— Our goal is to provide fundamental, comprehensive, high-quality practice-oriented training for qualified specialists in the field of law. Our professors include Honored Lawyers of the Russian Federation, a lot of practicing lawyers, 30 full PhDs, and 45 PhDs.

Nika could stand it no longer than ten minutes. Making sure that the parents were absorbed in the presentation, she quietly slipped out of the auditorium. The presentation seems to last a long time; if she's lucky, she'll be back before it is over. If her parents notice that she escaped, she will say that she went to explore the university.

The sun was shining outside. There was a lawn mower humming in the distance. "I'm going to take a little walk down the next few streets and come back," Nika thought to herself. The trampled path led to a small park, where rosehip bushes were blooming. Suddenly she heard a strange buzzing sound from the park. Something like a spherical metallic… rabbit caught Nika's eye. The thing vanished in the bushes. Nika ran after it.

— I'm supposed to say, "curiouser and curiouser," the girl muttered.

Nika looked into the rosehip and lilac thickets. The robot was there; indeed, its streamlined white body was shimmering. He was hanging in the air as if he was waiting for her. Nika went around him and looked at him carefully. An inscription on its side said, "Temporomobile unmanned aerial vehicle, Model LK0001. Made in 2050."

— Oh, no way!—Nika was surprised. — Tempo-ro-mobile. Do you travel in time or something? The rabbit's eyes flashed pink.

— Set the coordinates, — the buzzing voice said.

— Hmm, — Nika thought. — I want to know what the world will be like when I'm… thirty years old.

The drone blinked and said, "Attention! Hold on to my ears. Destination: 2035."

Nika saw that the drone had some sort of handles on its ears. She gripped them with both hands. The world got spinning…
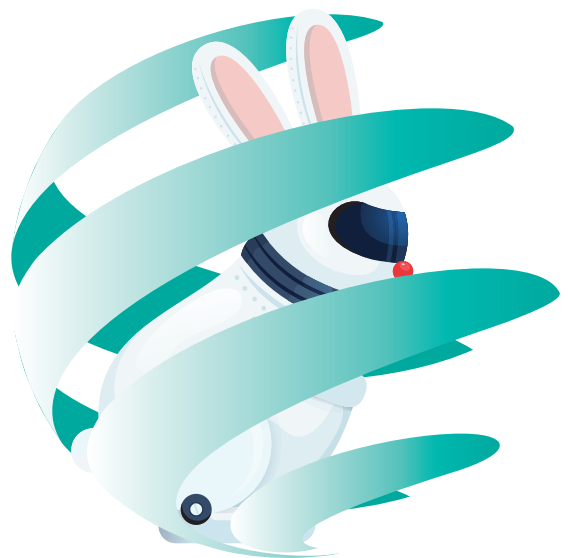
MEDICINE

Nika opened her eyes and let go of the ears of the robotic rabbit, then looked around. She stood in the middle of the spacious lobby with the light shining through the wide wall windows. There was a pretty girl behind the wooden reception desk. "Wait a minute!" Nika said as she got closer. It wasn't really a girl but an android. It had white skin, wide purple eyes with four hands typing on two keyboards at a time.

"The pediatrician referred you to the genetic counselor, room 107," the girl said in a slightly mechanical voice to the visitors, a young couple with a stroller. "And here is our intern. Nika, please show Lyudmila and Vadim the way."

"Oh, I don't …" Nika waved, but the android had already turned to the monitor. The visitors looked expectantly at Nika.

"Okay…" said Nika as she looked around. "Room 107. There we go."

They walked along a spacious corridor while watching a thin blonde squatted in front of the baby.

"Look, nothing terrible will happen." She got up and pressed the button on the wall panel, and a hologram of the digestive tract appeared in front of them.

"Swallow the candy with the camera and the doctor will look here," she poked into the intestines.

"Sorry," Lyudmila addressed Nika, alarmed. "Why do we need a genetic consultant?"

"Do not bother the girl, Lucy. We'll find out," her husband added.

The genetic counselor's office was surprisingly cozy. It looked more like a living room than a hospital room. It is decorated with blue wallpaper, a light leather sofa, and a striking white fluffy carpet.

In the next room, behind the frosted glass wall, there was a laboratory. People in white coats sat around an incomprehensible device: a huge flask connected by wires to the monitor. Microscopes stood next to the instrument, graphics flickered on the screens, and a poster of Bob Marley hung on the wall in the corner.

A pretty woman of about forty rose from behind a large oak table.

"Lyudmila, Vadim, please sit down. And you, Nika, stay."

"So, what do you need from us?" asked Vadim nervously. "You're a gene… who?"

"A genetic consultant," the doctor corrected. "Your child's tyrosinemia is a metabolic disorder, so the pediatrician sent me."

"If there is a metabolic disorder," Vadim frowned, "then what have the genes got to do with it?"

"Tyrosinemia is a hereditary disease that leads to the pathology of the liver and kidneys. But now, it is successfully treated in childhood by editing the genome," the doctor clarified.

"Wait a minute." Lyudmila entered and looked frightened at the baby in the stroller. "Do you want to make GMO from my child?"

"Don't worry," the consultant smiled softly, "gene modifications do not carry any danger now. I will call some specialists, and we will explain everything in detail to you."

She pressed the button on the small earpiece in her ear. "Sasha, Katya, come in, please." She then tapped on the keyboard, and a projection of a video monitor appeared on the wall. A young black man looked at them.

"This is Abimbola, our IT geneticist. He will be involved in editing the genome," the consultant explained.

The laboratory door opened, and a guy with dreadlocks and a girl with short pink hair appeared.

"And here are the guys. Let's discuss the operation plan."

"Operation?!" the parents simultaneously exclaimed.

"Very small, at the molecular level," the IT geneticist smiled. He spoke pure Russian, but his voice sounded slightly mechanical.

He uses a translator, Nika guessed.

"Everyone has a double set of chromosomes—each from father and mother. Due to a mutation in one of the parent chromosomes," the IT geneticist continued, "the DNA sequence in some important genes may change. Then, a person becomes a carrier of a genetic disease, as in your case." He smiled at Lyudmila and Vadim.

"You have no symptoms, but your child has both copies of the gene, which turned out to be wrong, so a genetic disease has occurred. To cure it, you need to find a 'typo' in the DNA and fix it. For this, we will use the genetic editor, CRISPR Cas9, or simply Crisper. One part of it will find a diseased portion of the DNA, and the other will be cut out. It needs to be cut very precisely so as not to cause mutations in other genes. Katya and Sasha will help us here."

"Katya is our tissue engineer." The consultant introduced the woman. "She will take a small piece of skin from the baby and reprogram the epithelial cells into stem cells. Stem cells are building blocks from which any tissue cells in the body can then turn out."

"And then we will cure them with Crisper and introduce them back," added Katya. "They will start the healing process in the body."

"But hey," Nika interjected, "the body is big! How do you make the medicine get to where you need it?"

"And we have me for that." Sasha smiled. "I am a targeted nanotechnologist. I am engaged in the targeted delivery of drugs to the necessary tissues and organs. In this case, we use a magnet."

"A magnet?" the parents asked in unison.

"Yes, we will make a kind of iron oxide nanoparticles package for the drug's components. Such particles can be incorporated into the tissues using a directed magnetic field, and they are turned off with the participation of the host immunity."

"My child has a serious genetic disease," Lyudmila jumped up from the couch, "and all you want to do is put magnets into it?"

"Don't worry, the iron will dissolve," the IT geneticist began. "We have a special device…"

"What can you do from your Africa?" screamed Lyudmila.

"Do not yell at him!" Nika was indignant. "He wants to help."

"Nika, please bring some water," the consultant asked and turned to the parents. "The situation is really difficult, that is why we've invited Abimbola. He is one of the world's best IT geneticists

and studied at the First Moscow State Medical University. Abimbola will remotely lead the process, and Katya and Sasha will do everything in the laboratory."

"What if something happens to the baby?" sobbed Lyudmila, Vadim squeezing her hand.

"The bioinformaticist and I will calculate the entire process on a computer in advance," said the IT geneticist. "This reduces the risks to almost zero."

The parents looked at each other.

"Well, what needs to be signed?" Lyudmila said in a sigh.

The consultant brought the tablet, and Lyudmila and Vadim left fingerprints on it.

"Listen! Since we're conjuring genes anyway, can we enhance our baby's muscle growth? Well, to become an athlete!" Vadim inquired.

"It's possible," the genetic consultant thought, "but there are also side effects."

"So, what?"

"I think it's better to connect a bioethicist to the dialogue. He will explain the nuances to you."

Abimbola disappeared from the screen, and almost instantly, a middle-aged man with glasses appeared.

"Good evening, Luke. Our customers are wondering if the boy's JNK* Gene can also be edited," the genetic consultant revealed.

"Yes, let him be like Ronaldo!" rejoiced Vadim.

"I understand your desire," the bioethicist adjusted his glasses, "but with such a decision, you limit your son's free will. Expression of the gene responsible for enhanced muscle growth simultaneously reduces sensitivity at the fingertips. What if your son doesn't want to be an athlete but a violinist?

"Violinist? By now, there has been no violinist in our family!"

"And yet, please think. Not everything is determined by heredity. Here, we have, for example," nodding to the genetic consultant, "a master of sports in rowing. Muscle metabolism is normal, just with a passion for the matter."

The consultant blushed and smiled.

"Thank you!" said Lyudmila when Nika and the consultant saw the family to the lobby.

"And we'll think about a football player!" Vadim promised.

Saying goodbye to the family, Nika turned to the consultant, "Wow, what a job you have! And this happens every day?"

"It happens in different ways. But look, twenty years ago, this kid wouldn't have survived at all. Now, in a couple of weeks, we'll fix it."

"But there is so much to know!"

"Knowledge is just half of the trouble," the consultant grinned. "The most difficult thing is to find an approach to people. So, I had to study medicine and psychology. In the afternoon, the institute. In the evening, communication courses."

She looked behind Nika, "Isn't that yours?"

Nika turned around. The robotic rabbit was hanging in the air.

"Oh, for sure! Thanks, I'm off."

She came up to the robot and grabbed its long ears. "Okay, that was fun. But now, let's go back! Mom and Dad will not understand."

The world started spinning again.

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*   This is an artistic assumption. The JNK gene is really associated with muscle growth, but it is not yet clear what results from its editing can be observed in people.

TASK

Make up similar stories based on the following cases and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might look like a room where the heroes work?

- What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case 1. You need to come up with a neuro helmet that would help the surgeon to control the surgical robot with the power of mind.

Case 2. It is necessary to simulate the course of an acute infectious disease on a computer in order to find a cure. To do this, you need to get information on databases of patients around the world, find the patterns of the virus, and simulate the effect of the drug on the body.

Case 3. You are asked to develop an in vitro* laboratory experiment to test a new drug—that is, create tissue from stem cells and see how the drug will affect certain groups of cells.

Case 4. It is required to remotely develop a diet and a set of preventive measures for an aging American rock star (let's say, Courtney Love), taking into account her genetics.

VISION OF THE FUTURE

DNA research has opened a new era in medicine. From the diagnosis and treatment of diseases of individual organs and tissues, doctors are moving to systemic work with human health. Gene analysis is now becoming an affordable service. In the near future, each patient will be able to present to the doctor a "natural outpatient car—a personal genetic code decrypted by specialists. The ability to identify genetic predispositions to diseases gives an impetus to the development of preventive medicine, the task of which is to identify possible diseases and prevent them at an early stage. And the methods of mass treatment are being replaced by individual therapy—at the level of the patient's genome. Thanks to the development of genetic technologies, targeted therapy is being developed that allows a targeted effect

on a particular pathology (for example, cancerous tumors) without affecting healthy tissues.

Robotics also is an important matter: automatic devices are superior in accuracy to surgeons, and advanced cyber prostheses can not only compensate for physical defects but also open up new possibilities for a person.

Special robots will be able to perform operations with minimal tissue damage, which reduces the risk of wound infection and avoids postoperative scars.

Personalization of treatment is one of the key trends in medicine and pharmaceuticals. The development of digital technologies will allow us to simulate a scenario of the development of the disease on a computer for a specific case and to develop an individual treatment technique. And pharmaceuticals industry,

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*   In vitro, i.e., outside a living organism.

in search of new markets, is reorienting from a wide audience to narrower segments of patients. For example, people with certain genetic characteristics, patients suffering from very rare diseases.

Pharm will increasingly use biotechnology; for instance, to create a new generation of antibiotics using biological solutions: antimicrobial peptides, editing the genome of bacteria, etc.

In addition, thanks to genetic engineering, it will be possible to raise animals with organs suitable for transplantation. Or, more ethically, grow artificial organs from stem cells in a bioreactor or even print them on a 3D cell printer. For example, scientists from Duke University grow artificial muscles, and in the laboratory of the Institute of Regenerative Medicine Wake Forest, there are printed up to 30 species of different cells and organs.

So far, it is not possible to fully grow complex human organs, such as the liver or heart (only partially or in miniature), but the technologies are developing very quickly, and artificial skin or nose can be implanted now.

Diagnostic technologies are being developed, including distance medicine. New tools are already in use and will be developed, such as gadgets for remote diagnostics and computer programs for data analysis. There are a lot of options—for example, the dermatological application, Derm Experts, estimates the severity of skin lesions by comparing photos of patients with images from the database. Intel and General Electrics created a remote support system for people with chronic diseases. With the help of gadgets, it is already possible to predict epileptic seizures, track blood sugar levels, remotely read pacemakers, and much more.

Life expectancy is increasing, and the population (especially in Western countries) is aging. Because of this, the proportion of people with chronic diseases and those diseases with which people did not usually survive before (for example, dementia or cancer) is growing. This poses new challenges for medicine.

Solutions that prevent diseases are needed—health monitoring, genetic tests for risks, the development of drugs that prevent or at least inhibit the development of diseases to which a person is predisposed.

In addition, more startups are appearing, exploring ways to prolong life and slow down the aging process (Google Calico project, LyGenesis, Russian Gero project, etc.).

Another important task is to reduce the time gap between the invention of a new drug and its entry into the market. In order for the new medicine to be approved by federal services, it must go through several stages of testing: computer simulation, in vitro laboratory tests, animal tests, and finally, human clinical trials.

The process can be accelerated with the help of more advanced technologies of computer simulation and research on tissues grow in vitro. However, the availability of a suitable medicine does not mean that the patient will take it regularly—many are self-medicating, confused, arbitrarily changing the dosage, or simply forget to take a pill.

Perhaps this problem can be solved with the help of micro-implants that regularly release the right dose of medicine into the body or smart tablets with chips that transmit a signal to the doctor's device that the pill has been swallowed.

It sounds like science fiction, but the first smart pill entered the market back in 2017. It was aripiprazole capsules (a cure for psychosis), released by Proteus Digital and Otsuka Pharmaceutical.

While in developed countries, patients can analyze the genome and use targeted therapy, according to WHO, 400 million people do not have access to one or even several necessary health services. So, another serious challenge is the development of cheap diagnostic and treatment technologies for third-world countries that could be used in the field. For example, scientists from the United States and Sweden have found a way to turn the Nokia Lumia into a compact microscope for diagnosing cancer.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

BIOETHICIST

A specialist who provides the legal and ethical framework for the activities of medical diagnostic and bioengineering centers in which transplantology and genetic modeling are carried out.

CROSS-PROFESSIONAL SKILLS

GENETIC CONSULTANT

A professional conducting initial and planned genetic analysis in diagnostic centers, processes data from diagnostic devices, and gives an opinion and recommendations on further treatment regimen.

CROSS-PROFESSIONAL SKILLS

CLINICAL BIOINFORMATICIST

In the case of a non-standard course of the disease, he builds a computer model of the biochemical processes of the disease in order to understand the causes of it (reveals violations at the cellular and subcellular levels).

CROSS-PROFESSIONAL SKILLS
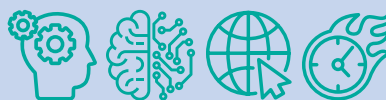
HEALTH R&D MANAGER

A specialist providing communication between research, diagnostic and preventive institutions, managing cooperation programs, and joint projects. His role is to assemble a suitable team of scientists, engineers, researchers, and developers, as well as focusing them on the implementation of commercially promising ideas and coordinate all joint work in the process.

CROSS-PROFESSIONAL SKILLS

MOLECULAR NUTRITIONIST

A specialist in the development of individual nutritional schemes based on data on the molecular composition of food, taking into account the results of a genetic analysis of a person and the characteristics of his physiological processes.

CROSS-PROFESSIONAL SKILLS

MEDICAL ROBOT OPERATOR

A professional who runs diagnostic, therapeutic, and surgical robots, with programming skills. Robotic surgery is not a new direction; it began to develop in the 1980s.

CROSS-PROFESSIONAL SKILLS

IT GENETICIST

A specialist who is involved in genome programming for given parameters, in particular, preventing the development of hereditary diseases.

CROSS-PROFESSIONAL SKILLS

DEVELOPER OF CYBER PROSTHETICS AND IMPLANTS

An engineer who will develop functional artificial devices (cyber prostheses) and organs compatible with living tissues.

CROSS-PROFESSIONAL SKILLS

TISSUE ENGINEER

A professional who develops a technological process and selects materials and conditions for the formation of a specific tissue or organ. A transplant surgeon uses the results of his work.

CROSS-PROFESSIONAL SKILLS

MEDICAL INSTITUTION LIFECYCLE PLANNER

A specialist in the development of the life cycle of a medical institution and its management, from design to closure.

CROSS-PROFESSIONAL SKILLS

PERSONIFIED MEDICINE EXPERT

A professional who analyzes the patient's genetic map, develops individual support programs (diagnosis, prevention, treatment) and offers appropriate medical insurance products.

CROSS-PROFESSIONAL SKILLS

HEALTHY AGING CONSULTANT

A specialist in the medical and social sphere, developing optimal solutions for the problems of an aging population. Such a specialist will help to correct the lifestyle, select the appropriate diet, and physical activity.

CROSS-PROFESSIONAL SKILLS

ONLINE GP

A high-class diagnostician who owns information and communication technologies and is able to diagnose online. Focused on preliminary diagnosis and prevention of diseases.

CROSS-PROFESSIONAL SKILLS

TRANSLATIONAL MEDICINE SPECIALIST

A professional who is looking for ways to accelerate the path from developing a promising new medicine to its entry into the market, for example, through computer modeling and high-tech laboratory research.

CROSS-PROFESSIONAL SKILLS
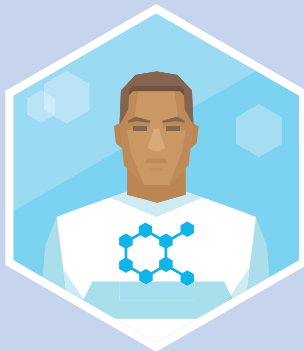
TARGETED NANOTECHNOLOGIST

The developer of methods for the delivery of drugs that ensure targeted cancer cells. Targeted drugs can act only on the tumor without harming healthy tissues. They can damage the vessels that feed the tumor, block biochemical signals for reproduction, and even turn off individual genes.

CROSS-PROFESSIONAL SKILLS
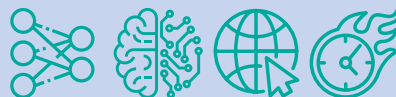
PHARMACOLOGICAL ECOLOGIST

A specialist who regulates environmental safety in pharmacological production. According to the international classification of environmental safety of production, pharmaceutical laboratories and enterprises are at risk. Therefore, specialists able to assess and prevent this risk are required.

CROSS-PROFESSIONAL SKILLS
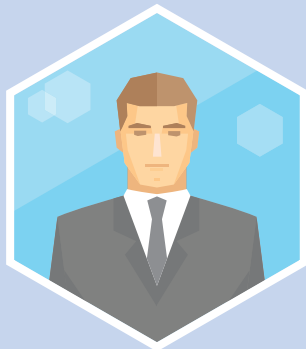
MEDICAL MARKETER

A specialist in market research in the field of pharmacology, medical services, and medical equipment; develops the marketing policy of an enterprise or research center. Another profession that has long existed in the world, though in Russia. It is quite new since, until recent times, all medicine was state or near-state.

CROSS-PROFESSIONAL SKILLS
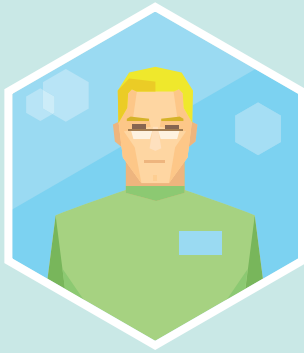
IT MEDIC

A specialist with good IT knowledge to create and manage physiological databases (for example, analysis results), create software for medical and diagnostic equipment.

CROSS-PROFESSIONAL SKILLS
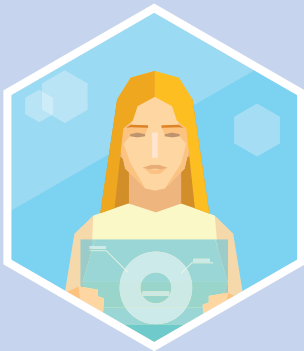
MEDICAL EQUIPMENT ARCHITECT

A multifunctional specialist who designs equipment for various medical tasks, with knowledge in the field of engineering and computer graphics, materials science, machine parts, and electrical engineering. This profession already exists, but as more functions in medicine are automated, the demand will grow.

CROSS-PROFESSIONAL SKILLS

annoyance 08%

affection 85%

joy 40%

sadness 10%

MEDIA AND ENTERTAINMENT

The robotic rabbit lowered Nika to a wide balcony next to a palm tree. A guy with pink hair was walking on the treadmill to the left, and a girl was dozing in a hammock nearby. This place did not resemble a home apartment.

Behind Nika, there was a buzzing sound.

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Behind Nika, there was a buzzing sound.

"What, have you realized that you screwed up?" Nika turned around. But in front of her was a large drone in the air with a fastened box of pizza.

"Order K-08, the editorial board of Post-truth.ru," the speaker wheezed.

Nika looked around. No one was in a hurry to pick up the food, and the girl unfastened the belt and froze with the pizza in her hands.

"Oh, food has arrived." The guy with pink hair jumped off the treadmill, opened the box, and took a pizza slice.

"And you, probably a new intern? Nice to meet you. I'm Anton, editor of content aggregators."

"Editor of what?"

The guy grinned. "Content aggregators. I give tasks to people, bots, drones, and neural networks. They send me everything: articles, videos, and I form the news feed of the site." He nodded at the pizza. "Take it, don't be shy."

He headed inside. Nika rushed after him.

"Good thing you came. We are all standing on our heads because of this volcano."

Inside, the editorial office was spacious and bright. Sure, people didn't stand on their heads, but rather, sat at tables and lay on ottomans and in hammocks. It was noisy with dozens of conversations in different languages and continuous knocking on keyboards.

On the LCD screens, news flashed continuously. "In Europe, 5,000 flights were canceled due to the Icelandic volcano Katla's eruption," Nika read the running line.

"Let's take a look at how our drone is doing." Anton sank into the nearest empty chair in front of the laptop and jabbed a finger at the touchpad.

A video appeared on the screen in a bird-eye view. Through the puffs of smoke, there was a visible volcano vent. Bright orange lava shot from its gut and flowed down the slopes. The camera circled the volcano from all sides. Nika peered, fascinated at the picture.

"So, there is a video, and there is a comment of experts. Where is our emo?

"Who?" the girl asked.

"Not an emo, but a designer of emotions," a thin young man with a light brown beard and an impenetrable face rose from the table. "I figure out how to influence the different senses of consumers of content," he explained to Nika. "For example, now I just finished the smells of burning and ash for complete immersion.

"And how do people smell them? Through the monitor or what?" Nika grinned.

"Through the air freshener. It is a kind of printer. It mixes the smells of the cartridges to convey the flavor of the event. By the way, do you want to try my new tropical mix? I did it for a long read about rest."

"You can smell it later," Anton interrupted. "A message just came from Hilder. This is a private content maker and a video blogger from Iceland. She makes reports for us."

A video with a red-haired girl appeared on the screen. Behind her was a slope with multicolored houses of the same type.

"Hæ!" she said in Icelandic, but the translator immediately turned on: "Hello!" A pleasant female voice overlapped over Hilder's. "Behind me is a refugee camp, freshly printed on a 3D printer. The government set a new record: created this in just two days. The camp is designed for 700 people, and 500 have moved in already. Food and water are delivered by drones that also take away the garbage."

"Fine." Anton nodded. "We still need the article itself."

He opened a file in the editor and had a quick look. Then he raised his eyebrows. "Kuzya, based on which authors did you configure the neural network? According to Deadpool, or what?"

"No," said the guy at the next table. "According to Joe Rogan. The game-changer in journalism. What about it?"

"I also love banter, but here, we are talking about disasters and refugees.

"A neural network is a computer program, isn't it?" Nika wedged in. "Does it write well? What kind of imagination can a computer possibly have?"

"Tell me now that it has no soul," Kuzya grinned. "A neural network simulates the brain's functioning and learns much the same way as a child. We give it cool texts; it processes them and learns to write well, following their example. People do the same. Nothing is invented from scratch. We also use old ideas and combine them in a new way."

"Drones, neural networks, bloggers, experts—and all at once," Nika muttered. "How does your head not spin?" She asked, looking at Anton. "Permanent mess!"

The guy smiled. "You're just like my mom. She sent me to study accountancy. And what, stability! Well, I ran away to the media faculty at the last moment. And then where would I be with this stability? In accounting, for a long time, algorithms do almost everything."

The tablet vibrated in his hands, and Anton frowned.

"Oh, the AI calls. We messed up somewhere, see. Come on!"

The editor got up from his chair.

"AI, artificial intelligence?" asked Nika, confused. "Does your computer control you?"

"No," Anton grinned. "This is what we call Arina Igordina. She is the producer of the semantic field."

"And what kind of semantic field?" Nika asked on their way.

"Well, look. Let's say you read a newspaper. There, colonists fly to Mars, a research institute of cognitive sciences is opening in Nigeria, scientists are about to invent a cure for aging, and it seems to you that everything in the world is good.

"And then you read another newspaper, and there, terrorist attacks, robberies, and a failing economy. This will automatically give you a completely different impression. So the producer of the semantic field is responsible for ensuring that the impression is balanced."

"Where is everyone?" Nika looked around in surprise as the conference room was empty.

"The AI is at a conference in Stockholm," said Anton, turning on the wall's monitors. "Vasya, a designer of smart advertising, is in Yekaterinburg."

"And why do you need a designer?" Nika questioned.

"We'll find out now," Anton sighed, sitting down in a bean bag chair.

The screens lit up, and a video link appeared on each of them. A woman of indefinite age with a beautiful silver hair styling appeared on the right, while a plump freckled man appeared on the left.

"Anton, my darling," the semanticist spoke softly. "I looked at the grid. You, with the volcano, have too much negative information. Just yesterday, there was a terrorist attack; you can't crush people like that."

"What can you do if life is like this?" Anton shrugged. "You can't embellish it."

"Life is always like that. It is important to show that you can do something in any situation."

"We can put a video about donation nearby," the designer of smart advertising intervened. "According to studies by behavioral economists, after disaster stories, people are more responsive."

"Great!" the semanticist nodded.

"Just don't forget about insurance advertising," the designer added. "The robot has already generated a video. Do all your helmets in the neurofeedback room work well? Tomorrow, you need to check out the video on the focus group, whether it causes an emotional reaction."

"Damn manipulators," Anton snorted.

"We love you too," smiled the semanticist.

Nika and Anton quickly checked their helmets. The girl wanted to stay longer in this strange room with many screens and helmets hanging from the ceiling, but the editor impatiently clapped his hands: "Well, is that okay? Then I will go back to work."

"How can I help you?" Nika perked up.

"No, it's a side job. I also work as an infostylist. I select news and posts according to the interests of the customer. He will open the feed in the evening and get a ready-made selection. Now, we need somehow to mix info about octopuses and knitting for a scientist."

Nika looked around in dismay and quietly asked: "And you will not be fired for this? Do you work part-time at the office?"

"Who cares where?" asked, surprised Anton. "The major thing is that I complete all the tasks. And anything else I am doing is nobody's business." He winked at Nika and went with the tablet into the hammock.

They're cool; Nika thought and went to the balcony. *Is there any pizza left?*

The box was empty, and the roborabbit started buzzing overhead.

"It would be better if you brought some food." Nika sighed, grabbing its ears.

TASK

Make up similar stories based on the following cases and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- What can be called a team for each case? How many different specialists do you need to complete a task?

- What might look like a room where the heroes work?

- What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case 1. It is necessary to create a context-dependent (that is, using information about the player's state to form the course of the game) ARG-game about the secret order of magicians in St. Petersburg, which would involve different senses.

Case 2. You need to come up with a line of gadgets that will complement the interactive series on the Star Trek universe.

VISION OF THE FUTURE

In the twentieth century, the media became one of the main ways of communication, and their task was to provide people with maximum information about what is happening around the world.

In the 21st century, media's role is changing: we have been inundated with various information. Now, the key task is to limit the number of information flows and choose the most interesting and useful for the user. Media resources turn from unique news sources into powerful filters. They decide what to make an emphasis on and serve as a guide through the labyrinth of the agenda.

In social networks, you can already configure the feed to read only interesting pages or filter information using special add-ons; but so far, these systems are far from ideal.

In the future, the user will be able to create the information flow himself and determine the principles for editing it. To do this, media programs will be developed—search engines, sorters, and information converters, capable of creating individual information collections (something like customized news feeds) at the request of consumers.

Machine services will be developed for automatic text translation, speech recognition, search, extraction, sorting, and data processing. With the advent of new technologies, localization of content for a specific language will begin to occur automatically at the stage of information delivery. For example, the hero's voice in the film will be superimposed in the process of broadcasting the film, and not in advance by expensive and long voice acting.

Thanks to the advent of such technologies, it will be possible to publish content on the website of any country without additional linguistic adaptation.

Nevertheless, the role of the mass media will remain, as many users will continue to use the standard settings, refusing to personally influence what they receive. However, in the post-truth era, it became obvious how far we are from objectivity in evaluating news and choosing its source.

Social media news feeds, where we usually subscribe to people with similar views, form "information bubbles" around us, which prevent us from seeing other points of view and expand our horizons.

Well-placed emotional accents can affect the global picture more than reasonable arguments. Therefore, on the one hand, there will be a demand for media workers who are able to form a global picture with a wide audience, taking into account the achievements of social psychology and behavioral economics. On the other hand, among people seeking diversification, there will be a demand for information collections that deliberately take into account diverse points of view.

Also, due to the abundance of fake news, it may be necessary to check the content for authenticity. For example, Elon Musk is going to launch a website with ratings of the veracity of articles and journalists.

Due to the growing automation, many journalistic functions will shift from person to machine. Already, almost a third of the content published by Bloomberg News is created using algorithms that partially automate the process. Also, the Australian version of The Guardian in 2019 released a text completely written by artificial intelligence.

Professional journalists will continue to work in formats that require great creative talents, such as author journalism. And in reports from hazardous areas (active combat zones, places where disasters occurred, etc.), drones will work instead of human operators.

On the other hand, expert content makers, who often turn out to be witnesses of interesting newsbreaks and learn to produce more and more high-quality text, photo and video content, are driving out professional journalists.

Media will also be accessible on wearable devices. Already, you can find out about the latest news using the Apple Watch, and in the future, the news will be coming directly to AR glasses and contact lenses or even to clothing items. This means that new short formats will be required, adjusted to the context in which a person uses devices.

There will be a mass introduction of new technologies for influencing the human perception organs (sense of smell, tactile sensations,

taste, sense of gravity)—new information delivery channels will help the media and entertainment industry reach even closer and more realistic contact with the consumer.

Context-sensitive games are developing (these are games that use physical and digital information about the current state of the player to form the course of the game), as well as games with biological feedback that collect information about our physical condition. This will allow us to gamify a healthy lifestyle. For instance, the game "Zombies, Run!" helps make jogging more fun.

In the long run, it will be possible to obtain a large amount of information about a user based on his behavior on media sites—from his political views to his emotional state. This will further personalize contextual advertising.

For example, if an analysis of your behavior in social networks and search engines says that you have experienced a breakup, you will often come across ads like "How to believe in love again." In addition, as the media becomes more interactive, this provides new opportunities for product placement. For instance, you can click on an actress's costume in a movie that you watch on a smart TV to find out where to buy it.

There are already first attempts to create movie trailers and commercials using neural networks. For example, the creative agency McCann Erickson in Japan has an AI that analyzes client briefs. In the future, creative people will often resort to the help of AI assistants in order to quickly sort out associations and generate original ideas.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

ARCHITECT OF VIRTUALITY

A specialist in designing solutions that allow you to work, study, and relax in virtual reality. He develops software and equipment, taking into account the biological and psychological parameters of the user (including custom-made orders).

CROSS-PROFESSIONAL SKILLS

EMOTION DESIGNER

A specialist who creates an emotional background of content using new channels of information delivery, including directly to the consumer's brain. He controls the effect on the senses so that the user experiences the necessary sensations and emotions during the consumption of content.

CROSS-PROFESSIONAL SKILLS

PRODUCER OF THE SEMANTIC FIELD (OR "SEMANTICIST")

A specialist who is responsible for shaping the overall picture of the world, in accordance with which media streams will be built. He manages programs that filter content, and they form information flows for users within a given picture of the world. (A "cultural sommelier" from Victor Pelevin's novel S.N.U.F.F. plays a similar role in society.)

CROSS-PROFESSIONAL SKILLS

GAMIFICATION EXPERT IN BLENDED REALITY

An organizer, creator, guide in entertaining gaming universes in physical and virtual spaces. There is a direction of ARG games in an alternative reality, where the line between the real world and the gaming world is very blurred. In the future, such games will develop further.

CROSS-PROFESSIONAL SKILLS

MEDIA POLICEMAN

A law enforcement officer in the media sphere. Searches for violations of the law by monitoring media resources in person and/or through special programs. Now in Russia, this function is partially fulfilled by the Federal Service for Supervision of Communications, Information Technology, and Mass Media (Roskomnadzor) and the Safe Internet League; but in the future, information abuse and cybercrime will increase so that this function will stand out as a separate profession.

CROSS-PROFESSIONAL SKILLS

MEDIA SOFTWARE DEVELOPER

A specialist working together with psychologists, linguists, and engineers to create software tools for searching, processing, and disseminating information in the net (search engines, semantic analyzers, aggregators, robots, writing information notes).

CROSS-PROFESSIONAL SKILLS

INFOSTYLIST

A person who selects information and style of its presentation per the requests of a particular user. Now, a stream of content is offered to a person in the form of a selection of recommended information products based on geo-targeting, user search queries, or interests indicated on social networks. This is done mainly by an algorithm that was created by someone for their own purposes (for example, by advertisers or managers of social networks). In the future, a person's desire to form such a flow for himself, without any influence, will create a demand for similar algorithms, which he or she will either write for himself or make an individual order for specialists.

CROSS-PROFESSIONAL SKILLS

FACT CHECKER

A specialist who checks the facts presented in the media for accuracy. He can work both for specialized resources laying out ratings of high-quality and truthful media and journalists, and by order of a demanding consumer of information. For example, in tandem with an info curator.

CROSS-PROFESSIONAL SKILLS

CONTENT AGGREGATOR EDITOR

He manages information channels and selects content that meets the expectations of users, setting up search engines, aggregators, automatic information analyzers, and reporting drones. This profession already exists in digital media, but as individual media grows, the demand for it will grow. Over time, it will turn from a separate profession into a universal editorial competency.

CROSS-PROFESSIONAL SKILLS

CREATIVE NEURAL NETWORK CURATOR

A specialist who sets up neural networks to work on creative tasks and coordinates their interaction with people. Despite the fact that creative processes are more complicated for computer programs than analytics, some stages of creative work (for example, enumeration of different solutions) can be algorithmized. There are already precedents. In 2016, an artificial intelligence created by Yandex developers wrote poems in the style of Yegor Letov, and a science fiction novel co-authored with a neural network passed the qualifying stage of the Japanese literary award, Hoshi Shinichi Literary Award. The computer program also appeared in scriptwriting, and based on its creation, director Oscar Sharp wrote the short film, "Sunspring."

CROSS-PROFESSIONAL SKILLS

SMART ADVERTISING DESIGNER

A specialist who creates more subtle and high-tech contextual advertising using data science, behavioral economics, immersive technologies, etc. Smart advertising is more in line with the interests of a particular user and has a greater potential for involvement through the use of user data and psychological mechanisms.

CROSS-PROFESSIONAL SKILLS

CONTEXTUAL GAME DEVELOPER

A game designer specialized in the development of context-sensitive games. The context includes the location of the player and the game objects near him, movements, emotional state, stress level, information about the interaction between several players. Examples of such games and platforms: Mogi in Japan, Pokémon Go, I Love Bees, Playstation EyeToy consoles and Nintendo Wii.

CROSS-PROFESSIONAL SKILLS

SCREENWRITER OF INTERACTIVE MOVIES / TV SERIES

A specialist who creates artistic scenarios in which the viewer can influence the plot. The television and film industries strive to reach new heights of emotional impact on the audience. In 2018, film director and producer Steven Soderbergh released the interactive series "Mosaic" on a free application for iOS and Android, where users could change the course of action. Screenwriters of the Black Mirror series have released the interactive Bandersnatch series for Netflix. Computer games are not far behind. The plot's dependence on the user's moral choice brought popularity to the games Heavy Rain, Life Is Strange, and Detroit: Become Human. All this requires new skills from screenwriters, both in understanding the psychology of the viewer and in building the plot.

CROSS-PROFESSIONAL SKILLS

PRIVATE CONTENT MAKER

A blogger who creates his own multimedia content, sometimes involving a team of virtual and real assistants for this purpose. A private content maker can lead his channel on social networks or occupy some niche in large media (for example, sell private reports or even report significant newsbreaks for a fee). Russian media, such as Meduza and Lifenews, are already actively collaborating with Internet users, and copyright talk shows on YouTube are gathering a huge audience (for comparison: the release of the YouTube show "Vdud*" in February 2019 gained 3.7 million views per month—this is more than the quarterly views of the entire channel "Russia Today**" in the UK).

* Yuri Dud is a popular Russian journalist https://en.wikipedia.org/wiki/Yury_Dud

** This refers to statistics on distribution, rt.com https://www.rt.com/about-us/distribution/

CROSS-PROFESSIONAL SKILLS

TRANSMEDIA CONTENT ARCHITECT

A specialist who designs content (characters, stories, conflicts, problems, educational content) and services for several mass media (television programs, games, etc.). He should be able to build a convincing system of interaction between different formats (consistency of character images and the relationship/complementarity of the stories that happen to them). This profession requires innovative thinking. For example, in an American school, as part of an art project, students encrypted the text of the poem in program code, then transferred it to the Scratch tutorial, which allows you to create animations, and then in LEGO Mindstorms EV3, the robot programming language. And in the online children's series "Inanimate Alice," they use text, video, pictures, and interactive games.

CROSS-PROFESSIONAL SKILLS

VIRTUAL WORLDS DESIGNER

A specialist who creates conceptual solutions for the virtual world: philosophy, laws of nature and society, the rules of social interaction and economics, landscape, architecture, sensations (including smells and sounds), living world, and social world.

CROSS-PROFESSIONAL SKILLS

TOURISM AND HOSPITALITY

Nika and the robotic rabbit flew over the field. Below, something strange was happening: horses were running, people in old military uniforms were rushing around, and tents were whitening.

"Come on down!" shouted Nika, and the roborabbit began to descend.

As soon as the girl's legs touched the ground, a guy in a uniform and AR* glasses ran up to her.

"Here you are!" he handed Nika the same glasses and a badge. "We have already begun, let's go!"

"Blogger Nika_seeker19," she read. "Press tour of the festival, Borodino: 2035."

"I love your channel!" said the guy, leading her to one of the tents.

It turned out to be crowded inside. A couple of teenagers were doing a live broadcast; a man with a full beard was quickly typing something on the phone.

A young woman in a wheelchair was speaking on the earpiece: "… I was afraid to get stuck in a clean field, and here are excellent paths with ramps!"

Nika moved forward. Before the bloggers stood a curly girl in a Napoleon hat. "Borodino," she said, "first museum in history on a real battlefield, and now, in peacetime, it is important to understand how wars arise and how people passing through the war perceived the world."

"Marina Skvortsova, brand manager of the festival," the woman in a wheelchair continued. "She developed the new concept of Borodino…"

Nika put on AR glasses, and the world changed. At the edge of the tent to the left of her appeared like a hussar with a saber. In the speaker, she heard an echo of thundering guns.

The brand manager stepped back, and a bald man with an earring in his ear stepped forward. On the interactive display behind him, the landing page of the Borodinsky application flashed.

"I am Alexei, a developer of the tour navigator. This app will help you plan your trip to the festival. It is enough for the user to choose the date and place of launch, and Borodinsky will select the best tickets, show convenient hostels and hotels. It will guide along the routes of the festival. And do not forget that the application includes a quest," the developer smiled. "Complete tasks and answer questions to score points and find treasure."

Nika's phone vibrated. She brought out her smartphone, surprised.

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*   Augmented Reality.

"Wow! Is there coverage?" She pointed her phone to the QR code on the screen. The application got downloaded, and a window flashed with a choice of routes.

"Miss," her sleeve was tugged by somebody. Nika turned around. A ginger kid stood behind. "Will you go play the soldiers?"

A woman in a wheelchair drove up to them, smiled embarrassed at Nika, and took the child by the hand.

"You have a children's route, and the lady and I will go our own way. I don't know whether to choose the historical one or according to 'War and Peace,'" she said.

"I would have taken War and Peace," Nika answered. "We will pass it soon."

"To Bezukhov and Bolkonsky? Well, I'll come with you then," the woman rejoiced. "I'm Tanya, by the way."

A tall man with a beard in a dragoon tunic approached the child and squatted down:

"Well, young man, are you ready for a battle?"

"Will you give me a saber?"

"For you? A saber!?" Tanya got scared.

The man turned to her and raised his hat and banged his spurs, "Do not worry ma'am, we will return safe and sound," he reported bravely. Tanya hugged the child, and the man smiled broadly and said in the usual tone: "I am Semyon; I am responsible for family routes. Don't worry. We develop all activities with child psychologists and physiotherapists."

The man handed the child a shako. He commanded "to the left," and they marched out of the tent.

Bloggers scattered around. The bearded man went along the historical route, taking notes on the go. Teenagers decided to wander by their selves: a name was displayed above each object, and arrows—difficult to get confused showed the directions.

At the exit of the tent was a blog shooting. The operator revolved around a bright girl with brown hair, changing angles.

"Especially for us, Borodino has developed an individual route, taking into account all the wishes and features," the girl said. "Afraid of walking across the field in high heels? No problem! Indicate this, and the director of individual tours will make a route with tracks."

"Internet celebrity" Tanya said with slight envy. "This will only be offered to mere mortals after the opening."

As soon as Nika and Tanya chose the route in the tour navigator, a pleasant male voice came in their ears: "The war with Napoleon formed the basis of the military conflict of 'War and Peace' by Leo Tolstoy …"

They went along the road, listening to a lecture. The route was laid with luminous lines right under their feet.

Nika and Tanya got to the hill on which the snow-white tent was spread. Nearby was a fireplace. A lone holographic soldier made a fire.

Nika focused on the tent, and another hologram emerged from it—a heavy one-eyed man, Kutuzov. A little behind, two already quite lively blogger guys located troop schemes on a touch monitor.

Robots scurried back and forth along the path of the route, placing litter-boxes around the edges. The girl with the tablet smiled at Nika with Tanya. "An eco-curator at your service," she nodded. "We have almost finished. Here, we have a separate waste collection. All waste from the festival will be recycled."

"To add credibility to the description, on September 25, 1867, Tolstoy went to the site of the Battle of Borodino," continued the lecturer's voice.

Nika and Tanya reached for the string of the carts. "Wagon train," an inscription appeared in the glasses, and a red arrow appeared over one of the wagons.

"It seems we have to go there," said Tanya.

Inside was a man with a beautiful pale face. A thin big-eyed girl in an old dress leaned over him.

"Bolkonsky!" Tanya cried out adoringly.

The hero turned to them, and in a broken voice, asked: "How long do I have to live?"

Smartphones buzzed, Nika got her own. Response options popped up on the screen. The girl shrugged, poked at random, and the application awarded her 10 points.

"Tolstoy masterfully shows the whole tragedy of war for each of the participants, thereby warning humanity against new wars," the lecturer said in the speakers, and the route ended.

Nika and Tanya found themselves at the wide tent in which they started. The bearded man brought Tanya's child, grimy but happy.

"Your little fellow, ma'am!" He bowed. "Please note: all our routes are synchronized so that guests do not have to wait for each other."

"Mom, mom!" the kid rushed to Tanya. "Kutuzov drove us on the parade ground! We did push-ups and walked on a log. I almost fell, but Kutuzov said that I was so dexterous, I could be a hussar." He pulled out a smartphone and tapped on the screen.

"The last step is left! Now, they will show where the treasure is." The child's face suddenly stretched out. "Mom, nothing happens! Kutuzov has appeared and is standing idle," the boy grimaced and began to rub his eyes with a dirty fist. "Mom, where is my treasure?"

"Stop the panic!" Tanya took the phone from her son and found the SOS icon in the application. Within a minute, the developer of tour navigators ran up to them.

"What happened to you?"

"The augmented reality has stopped working for the child," Tanya pointed to her son.

"We'll fix it now. We'll contact the game fixers, and they will correct it. The guy took out a tablet and poked it in the video chat icon. A man of an Asian descent look appeared on the screen. "Kaiyrbek, here at the end of the children's quest, Kutuzov has frozen."

"I see," the gamificator answered and quickly pounded the keys.

"Oh, everything has started moving! Thank you, Mr. Chinese!"

"I'm not Chinese," Kaiyrbek smiled, "although I studied at Peking University. But actually, I am from Kazakhstan."

Victory music played in the kid's glasses.

"Mom, mom, I see where the treasure is. Let's follow the arrows," and he pulled Tanya by the hand. "I will also become a hussar," he proudly declared to Nika.

"Hussars don't exist anymore. Maybe a programmer? Programmers are paid a lot of money," Nika suggested.

"Yes, he will change so many professions in his life," Tanya smiled. "The main thing is that they will be interesting, right?"

"Yes," Nika said. "He is lucky with his mother."

She got a little sad and looked away. Above the cannon, rabbit ears appeared in front of them.

"Here you are. Where have you climbed!" Nika muttered to herself under the nose. She waved to Tanya with the child, "Good luck with the treasure!" and ran to the robot. "Let's do something more complex."

And everything spun again.

TASK

Make up similar stories based on the below cases and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- What can be called a team for each case? How many different specialists do you need to complete a task?

- What might the place where the heroes work be like?

- What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will take a prize!

Case 1. You are asked to come up with an individual tour of the Trans-Siberian Railway for foreigners, which would take into account the characteristics of intercultural communication.

Case 2. It is necessary to create an excursion-game on Oxford in the times of J.R.R. Tolkien, which would help school children gain important knowledge in history and literature.

VISION OF THE FUTURE

The hospitality sector remains one of the sectors with significant development potential, both due to demand from Russian tourists and the interest of foreign guests. Opportunities for growth are, first of all, outside the megalopolises of Moscow and St. Petersburg, in large industrial centers, small cities with a long history and nature reserves.

The development of transport systems and increasing mobility will allow travelers to quickly and easily get to their places of interest, and this means that the tourism and hospitality sector will face new challenges associated with an increase in the number of tourists and their needs.

This sector is one of the first where a tendency towards a decrease in the number of intermediaries between the consumer and the service is noticeable. Therefore, many mass-use services will be simplified and automated. Among them, unified transport systems and travel tickets, and tools for building individual travel logistics. Moreover, automated dispatchers to synchronize individual public transport, service robots, electronic guides, and devices for simultaneous translation. In this segment, many professions "retire"— a significant number of jobs will be taken over by algorithms.

Since the variety of choices will make tourists pickier, new tourist formats and opportunities for customizing holidays to the user's request will appear, in accordance with the physical form, tastes, and interests.

With the development of VR technologies, one of the challenges for the industry will be competing for the users' attention with the media and entertainment sphere, because the client will be able to choose, say, between a trip to the USA to a real rock festival and a virtual multiplayer role-playing game "Woodstock."

Therefore, the industry will have to expand the range of services with these technologies in mind. For example, tourists will have an opportunity to participate in tours and shows with augmented reality, games, and reconstructions of historical events, as well as receive more unique experiences. On the one hand, successful branding of the territory contributes to this, and on the other, "tourism of experience," aimed at evoking unique emotions among guests. This includes gastronomic tourism, agro- and eco-tourism, spiritual tourism, etc. There is an increasing demand for masterclasses and authentic experiences that allow you to relax from the ubiquitous globalization and immerse yourself in a new and unusual way of life.

On the one hand, tourism is a serious burden on the environment, but, on the other hand, more and more touristic formats are appearing that encourage respect for the environment.

A well-thought-out camping infrastructure, with the expectation of leaving as few traces of a human stay as possible, as well as special eco-routes where at least flowers and berries cannot be picked and garbage cannot be left. Such routes are, for example,pass through Caucasus Mountains ski resorts, Karelia unique sites, Baikal lakefront and in other tourist destinations of Russia. In an ideal scenario, garbage collection is gamified (the most striking example in Russia is the Clean Games project, https://cleangames.ru).

CROSS-PROFESSIONAL SKILLS

1 Systems thinking

2 Cross-industry communication skills

3 Project management

4 Lean production

5 IT

6 Customer focus

7 Multilingualism/ Multiculturalism

8 Social skills

9 Working in uncertainty

10 Art and Creativity

11 Ecological thinking

SMART TRAVEL SYSTEMS DEVELOPER

A specialist who creates automated systems for buying tickets, navigation, and hotel reservations. Founders of tourism-related companies already make money by creating unique search algorithms—for example, AviaSales.ru. The demand for simple, convenient, and quick solutions in this area will only grow. In addition, personalization and the ability to create individual routes will be increasingly important.

CROSS-PROFESSIONAL SKILLS

TOUR NAVIGATOR DEVELOPER

An IT specialist who creates programs and applications that allow the user to navigate a specific route. When creating a route and important points, it will be a good idea to take into account the interests, mindcult, and plans of a particular user, as well as current cultural events.

CROSS-PROFESSIONAL SKILLS

ROBOTICS SUPERVISOR

A specialist supervising hotel robots. Robotic hotels already exist in the USA, China, Japan, and other countries, and although mechanical porters, maids, and couriers have proven their worth, they still require human supervision. Such a supervisor should be a highly organized specialist with multitasking skills, well versed in mechanisms and artificial intelligence.

CROSS-PROFESSIONAL SKILLS
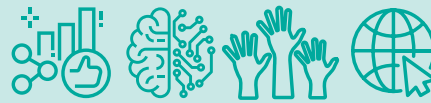
CURATOR OF CONSCIOUS ECOTOURISM

A specialist who creates and implements a culture of visiting forests and parks. His or her competencies include creating routes for ecotourism, planning infrastructure (electricity, water, places for separate waste collection), introducing environmental practices and teaching tourists behavioral philosophy.

CROSS-PROFESSIONAL SKILLS

FAMILY TRAVEL WRITER

A professional who creates comprehensive programs for tourists traveling with families. He or she takes into account age-related psychological preferences, organizing dynamic leisure, where children and adults can both spend time together and rest from each other (and this is no less important!).

CROSS-PROFESSIONAL SKILLS
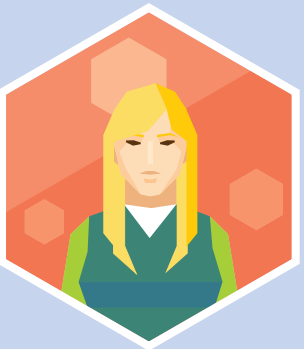
EDUCATIONAL TRAVEL CURATOR

A specialist at the intersection of tourism and education, who develops and implements tourism programs that are designed in order to develop certain skills. Today, educational tourism is mainly focused on the study of foreign languages, but it is obvious that its possibilities are much wider.

CROSS-PROFESSIONAL SKILLS
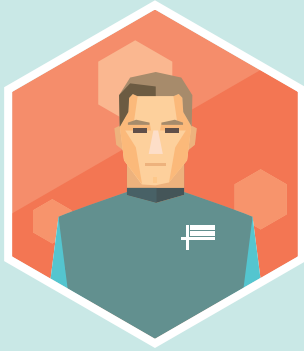
INTERCULTURAL COMMUNICATION COACH FOR TOUR GUIDES

A specialist who trains guides to find a common language with representatives of different generations and cultures. As tourist groups will be increasingly diverse in composition (this applies to age, nationality, and cultural codes), a guide in demand must be flexible and master different languages and communication styles.

CROSS-PROFESSIONAL SKILLS
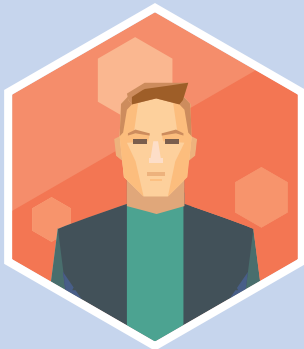
GAMIFICATOR OF TOURIST EXPERIENCE

A specialist who creates tourist games based on various attractions, historical facts, and local cultural features. As tourists increasingly expect unusual emotional experiences from travel, competitive advantages will be given to those who can turn an excursion or a master class into an exciting game.

CROSS-PROFESSIONAL SKILLS
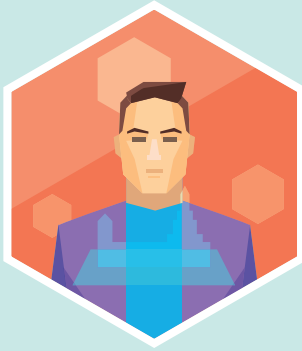
TERRITORY AR DESIGNER

A professional who develops various layers of augmented reality around a certain territory, considering its landscape, historical and cultural context. For example, he or she can create several options for Red Square, the times of Ivan the Terrible, 1917, the era of dandies, etc. Such a specialist should combine the skills of a designer and programmer with a good knowledge of history.

CROSS-PROFESSIONAL SKILLS

TERRITORY ARCHITECT

A specialist who creates "information landscapes" for tourists (pictures, descriptions, videos), taking into account the realities of the region, types of consumers, and currently popular destinations in the tourism industry. If a brand manager performs the functions of a creative director, then the territorial architect is a designer who finds specific detailed solutions for the tasks.

CROSS-PROFESSIONAL SKILLS
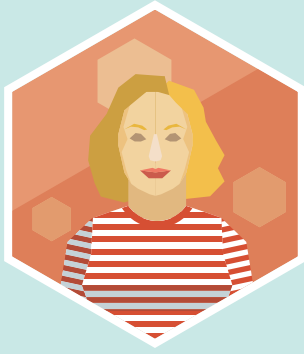
INDIVIDUAL TOUR SCRIPTWRITER

A professional guide capable of developing and personally conducting unique tours at the request of specific clients. This profession, in a sense, already exists (for example, Airbnb service allows guides to publish offers on original tours), but it will become widespread as traditional tour operators disappear.

CROSS-PROFESSIONAL SKILLS

TERRITORY BRAND MANAGER

A consultant and organizer who is responsible for filling the virtual space with cultural meanings associated with a specific territory. He creates the image and legend of the area, and design, identity*, information coverage, types of travel services, and various events that are united to this legend. All this gives the territory a uniqueness, allows you to attract visitors, and makes it a competitive center of tourism. The profession of a territory brand manager exists now, but over time its relevance will only increase—and the requirements for specialists of this profile, as well, respectively.

* A visual component of the brand, creating a complete impression of it and increasing recognition. It includes a logo, fonts, colors, etc.

CROSS-PROFESSIONAL SKILLS

INDUSTRY

The roborabbit lowered Nika and soared into the air. The girl tried to move but was tightly sandwiched between plastic pipes, boards, and drawers with small things. The room was tiny. Nika barely took a step and stumbled on something resembling a vacuum cleaner.

"Ah!" she shouted. "You put me in the pantry of the future?!" The girl got out from under a pile of things and pushed open the door.

Outside, it turned out to be much more interesting than inside. The spacious loft was full of light: enfilades of wide windows were on two sides. On one side, they were looking at a green wasteland. On the other, a huge workshop was visible. Sophisticated mechanisms, similar to giant robots' hands, dragged metal parts, smelted, welded, and bent them.

Wow! Nika looked around. Where did the robotic rabbit bring her this time?

Over her head soared, as if in zero gravity, a dozen spacesuits from old and bulky with the inscription "USSR" to more elegant, more of science fiction suits.

Enchanted, the girl walked under them.

The door caught her attention—the only one in the entire loft. The plate said: "Gagarin Space Plant. Digital Modeling Engineer Leila Lipshitz." The door swung open, nearly knocking Nika.

"Oh, you are already here," a slim, middle-aged woman appeared on the threshold. Behind her was a short, stout man standing. "Meet our forecaster, Seraphim. We have no time; we will discuss everything along the way." She made a hand gesture, inviting everyone to go.

"What happened?" asked Nika.

"Yes, all the same!" The engineer gasped in exasperation. "With so many months invested in preparing for a geological mission for an asteroid. How could one screw up with the calculation of the orbit? Now, the deadlines are tightening if we want to launch soon. Otherwise, it will have time to move away from the earth's orbit. And without new gloves, astronauts may not fly at all. What should they do there, look at the stars?"

They went out to the elevators. The engineer ran a card across the touch panel.

"And what kind of geological mission? Dig an asteroid or something else?" Nika asked.

The engineer nodded. "There are many rare-earth metals on metal asteroids, so much so that mining becomes quite cost-effective. For example, our asteroid is only one kilometer in diameter, and it contains seven thousand tons of platinum."

The elevator doors opened, Nika and the adults went inside.

"So, let's send robots," the girl did not relent when they smoothly drove down. "And do not fool around with gloves."

"It would be nice, but robots do not know how to make decisions in unpredictable situations. A human must control them. But it will not work from the earth. The signal delay for each command can be ten minutes one way. Can you imagine how slowly work will go? What if something else breaks?"

"Okay, Seraphim," she turned to the forecaster. "What is there with the load?"

The man frowned. "Actually, squeezing deadlines is a crime," he muttered. "Fortunately, we have a certain margin of safety, allowing the growth of mechanical stress by 30%. However, the CNC machine is at the third level, working at its limit. Half of the load should be removed. But with electricity, it is more difficult, especially for cyber-physical systems in the testing department. You need to be careful with maximum loads; otherwise, the network will break down.'

The elevator doors opened. Seraphim nodded and left.

"Nika, note down everything that we will discuss," said the engineer when they got to the desired floor. "We will have to decide what we will reject: a new fabric for gloves of a spacesuit or special spraying."

They walked along a metal bridge directly above the working mechanisms. "So many issues because of the gloves?" Nika was surprised, looking at the machines on the road. "Okay, helmet, but with gloves, what's the difficulty?"

The engineer smiled.

"That's a common misconception. Actually, a helmet is less complex to manufacture. At least you don't move it. And we are about to embark on our first geological mission to an asteroid, in which humans take part. We need completely new, more durable, and flexible gloves so that astronauts can accurately control mechanisms in outer space."

The engineer scanned his card, and they entered a room that looked like a laboratory. Electronic panels hung on the walls, transparent cubes with many sensors stood against the walls, tables were filled with flasks with colored substances.

A stately, Valkyrie-like woman and a short guy with brown hair and a beard came out to meet the visitors.

"And here are our stars of materials science," the engineer introduced them. "Designer of new materials," Leila pointed out to the Valkyrie, "she came up with a new, durable and flexible synthetic material. And the designer of cyber-physical systems—"

"Cyber … what?" Nika queried

"At the factory, there is always something to melt constantly, cool, mix, or spray," the engineer explained. "These are all physical processes. For them to flow accurately, they are controlled electronically, and the cyber-physical system is that controlled environment."

"And, thanks to her, we created special spraying that will protect our astrogeologists from the cold," the guy with brown hair added.

"It's not a fact that they really need it," the Valkyrie grunted, folding her arms over her chest. "My material is quite dense. Together with the old layer, it will work. I made a prototype, and everything is holding perfectly." She nodded at the glass cube; a glove was attached to one of its sides.

"You can stick your hand in and try what it feels like to move your hand in a vacuum," the woman said to Nika. "And, of course, the glove is incredibly flexible." The old ones are no match for it. Astrogeologists have nothing to do in space without flexibility.

"Somehow, the astronauts used to cope. But if the hands are frostbitten, they will have nothing to work with," the guy with brown hair said.

"Used to? There were no such missions before," the Valkyrie snorted. "They need fine motor skills."

"Colleagues," the engineer interposed. "I understand that both areas are important. But what to do if you have to choose one? I'm sorry, but judging by my data, the flexibility of gloves in this mission is more important."

"Yes, just to fulfill the order! You don't care about people's health." The guy with brown hair frowned.

"We checked the glove, everything will be fine with your people," the Valkyrie said, rolling her eyes.

"Come on, on a computer model?"

"Three-level test in virtual reality plus in vitro on living tissue.

"And on the person?" flashed the guy with brown hair.

"Yes, everything will be fine there," the Valkyrie said wearily.

"Ah. Well. Then I propose the final test!"

The guy with brown hair rushed to the cube and put his hand in the glove. He entered a command on the panel. Something clicked, and smoke fell into the cube. "Let's not trifle! Let's take extreme cooling."

"Take it out immediately! What kind of childishness is this?" the engineer exclaimed and rushed to him, but then there was a sharp crack, sparks flashed, and the workshop plunged into darkness.

After a moment, everything lit up with a red emergency light.

"Is everything fine?" The engineer asked.

"Yes, take out that damn hand," she barked at the guy with brown hair.

Nika noticed the man grimacing as he pulled his wrist from the glove. "How are you?" the girl asked him, but he did not have time to answer. The door swung open, and a team of guys with suitcases bursts into the room.

"What do you have here?" one of them asked cheerfully.

"Imbecility and courage," the Valkyrie muttered, squinting at the guy with brown hair.

"Oh, probably, a blackout," Nika said. "The forecaster said that you should not load the systems.

"I see," muttered one of the guys. "I want to understand.

"Send me a report on the cyber system's status," the engineer told him, pulling on his clothes. "And we are done here. We give priority to flexible materials."

"But hey …" the guy with brown hair mumbled, clutching his hand.

"We gave you a chance to argue your point of view," the engineer said dryly, "and for the sake of pride, you put the team and the whole process under risk. Nika, discuss the production plan for flexible materials." She nodded to her colleagues and headed for the elevators.

The Valkyrie pulled out a tablet and opened a document. "Look, for a batch of a hundred astronauts, we will need more of this raw material—"

The light flashed sharply, and they grimaced. Nika looked at the cube. The dashboard on it turned black.

"Olga," the guy with brown hair went up to the Valkyrie and touched her shoulder with his left hand. "Sorry, I got too carried away. You made fantastic stuff. It's fair that they chose your development."

"What's wrong with your hand?" The Valkyrie frowned.

"Oh, here," the guy with brown hair twirled with his right palm. The tips of his fingers turned white. "But you and Leila are right. No such extreme loads most likely will be there."

"No," the Valkyrie sighed. "You can't risk it. We will have to modify the material."

She thought for a moment.

"Listen; can you make me a cybersystem for tests? I'll try to add a layer of airgel …"

The man's face stretched out in a smile.

"Nika," the Valkyrie addressed the girl, "tell Leila that we will need to work together."

Nika nodded.

Ahead, at the exit from the laboratory, the robotic rabbit was already looming. "You and I are also a good team," the girl whispered to it.

TASK

Come up with similar stories based on the following case study and the list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the place where the heroes work be like?

- What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. The old defense plant, where ammunition was manufactured, is gradually reorienting to civilian products (because the demand for weapons is falling). Therefore, the management decided to open a new automated workshop, which produces children's robocats. In order for the workshop to work, it is necessary to order equipment for it, hire people who will work there, establish supply and sales processes, and predict possible errors and breakdowns. In addition, it would be nice to understand what kind of robocats children need and what are the best ways to make these robocats. For this purpose, the plant director assembles a new team.

VISION OF THE FUTURE

We are now experiencing the beginning of the fourth industrial revolution. The first occurred at the end of the XVII century after the invention of the steam engine, which became the impetus for the development of the industry.

The second came at the end of the 19th century with the invention of the conveyor and the development of mass production, as well as electrification.

The third industrial revolution was triggered by the advent of computers capable of making calculations much faster than humans.

What awaits us this time?

It is expected that the consequences of the fourth revolution (although it has already begun) will be felt en masse by about 2025.

In order to prepare for it, the National Technology Initiative was launched in Russia—a long-term comprehensive program to create the conditions for ensuring the leadership of Russian companies in new high-tech markets that will determine the structure of the global economy in the next 15–20 years.

The main features of the new industry are the fusion of technology and the blurring of the boundaries between nature, physical processes, and digital technology. These aspects are increasingly being combined already: new IT technologies allow you to simulate "digital" biological, physical, and chemical processes, as well as track and analyze them in real-time using sensors and special programs.

Similar processes will occur in the industry. Now, cyber-physical systems are being introduced in production, combining physical and computational resources. These systems will be combined into a single network (industrial "Internet of things") and will be able to communicate with each other, learn and configure themselves.

In developed countries, followed by them in Russia, factories appear that are automated by 90% or more. Today, digital production techniques are used in Magnitogorsk Iron and Steel Works, GazpromNeft, Russian Railways, Severstal, and other companies.

This means that representatives of factory workers are working for less and fewer hands, and are more and more involved in the programming and maintenance of industrial robots.

Digitalization of production transforms the workplace—augmented and virtual reality will become the norm of the production process at the plant, helping new employees to learn and prompting employees to solve problems. AR-technologies are already used at the factories of Boeing, Audi, BMW, Boch, Hyundai, and other well-known companies.

At the same time, a smart factory is much more than just automated production. It is able to monitor and optimize production flows, automatically diagnose and predict malfunctions, interacts with external market players—suppliers, consumers, and partners; make adjustments to the work, up to ordering preventive maintenance or repair to enterprise systems or third-party service companies.

Such production systems significantly change business processes. Production is decentralized, costs are reduced, profitability from piece production is increased, full cycles from production to repair, and disposal of the product are planned and automated as much as possible.

For example, the German startup Tylko offers customers to independently design a rack on the site to their taste, and then send the order through the site for assembly. This significantly reduces the need for people as intermediaries between the customer and the final product.

High-tech equipment at machine-building plants will become more modular and distributed so that the development of a new product line will quickly pass. Employees of such plants will begin to quickly assemble and re-assemble into highly effective teams, including people with the necessary knowledge and skills, who are able to quickly solve specific production problems. At the same time, at least some of them will be able to work remotely or generally outsource.

Factories and plants will have detailed digital models with which they can plan and optimize production, regulate logistics flows, predict equipment failure, check the parameters of non-standard products before production, and even conduct experiments to introduce new equipment and processes.

The production of goods in the future will be divided into two major areas: on the one hand, all mass production will be automated, and on the other, production will be developed at the request of small batches of unique goods. So, there will be a category of "digital artisans" producing a piece of copyrighted product using 3D printing and other digital technologies.

The introduction of additive technologies* allows cheaper to create products of complex shapes, as well as faster to create prototypes and improve them. Since 3D printers require less staff and can work around the clock, it becomes more profitable to make small batches of customized products. Additive technologies are used in mechanical engineering, biomedicine, aerospace industry, design, construction, and other industries.

Due to the rapid update of technologies, it will be necessary to organize effective retraining of employees in the field, and due to the fact that the functionality is shifting from routine actions to more complex intellectual work and decision-making in conditions of uncertainty, the approach to staff motivation is changing.

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*   Technology of layer-by-layer 3D printing.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

TECH-MEDIATOR

A highly qualified specialist working at the top management level of the enterprise. The basic tasks include research and analysis of changes in market needs, forecasting the future consumption patterns of potential customers. In addition, a tech-mediator is always up-to-date with the latest trends and understands the consequences of introducing modern technologies that affect production. He travels a lot and explores markets. At the enterprise, he leads a group to search and solve new business problems.

CROSS-PROFESSIONAL SKILLS

CYBER-PHYSICAL SYSTEMS DESIGNER

A specialist who designs cyber-physical systems for a specific task. He or she uses artificial assistants and consults with physicists and metallurgists, designing a model of the cyber-physical system in virtual reality.

CROSS-PROFESSIONAL SKILLS
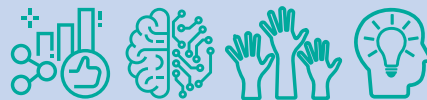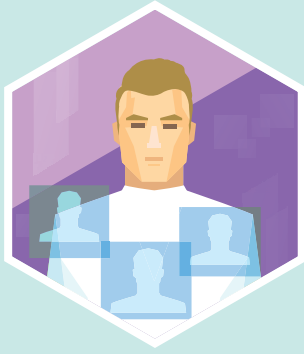
DESIGNER OF NEW MATERIALS AND TECHNOLOGIES

A professional who designs new materials and production technologies based on the required properties and the function that they must perform in the industry. To do this, he uses access to the results of processing big data on available materials. After receiving a digital model of a material or technology, he must independently obtain and test it.

CROSS-PROFESSIONAL SKILLS

CYBERSYSTEM MANAGER

A specialist who controls the operation of cyber systems in the factory. He or she can work with virtual and augmented reality interfaces, simulators, remote formats, and interact with different types of machines—robots, smartphones, workstations.

CROSS-PROFESSIONAL SKILLS
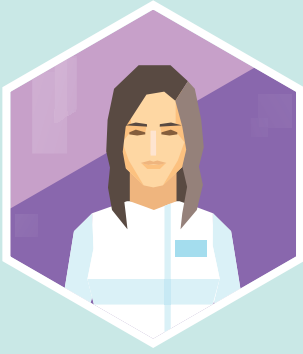
REPAIRMAN 2.0

A repair team consisting of specialists with high expertise in one or two core competencies (electrical, mechanics, electronics, etc.) and basic knowledge in the rest, which facilitates communication within the team and allows assisting each other during repairs. Repair specialists have always existed in the industry, but in new conditions, more coordinated teamwork will be required.

CROSS-PROFESSIONAL SKILLS
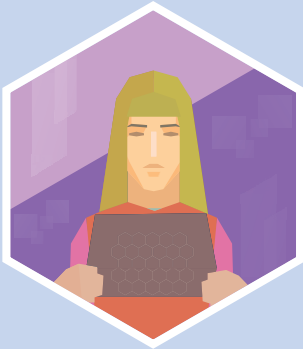
EQUIPMENT FAILURE FORECASTER

A professional who predicts wearing off and tearing in production equipment. To do this, he or she looks at the diagnostic data in real-time and runs it through mathematical or empirical models. Based on the results, he reports when it is time to do preventive repairs, how to reconfigure processes so that the equipment wears out less, and warns of possible breakdowns.

CROSS-PROFESSIONAL SKILLS

DIGITAL MODELING ENGINEER

A specialist managing a digital model of an entire enterprise. He or she is responsible for the efficient use of resources and investments, the balance of peak loads, the flexible revision of business models, and technological processes depending on the external environment, large-scale digitalization, which allows for taking into account changes in consumer requests, logistics, and after-sales services. He manages a team of digital engineers, collects virtual models of individual machines, units, lines of an enterprise into a single system until the appearance of an integral model of the technological process at the enterprise.

CROSS-PROFESSIONAL SKILLS

INDUSTRIAL FLOW LOGISTICS SPECIALIST

A professional who works primarily with software, designing, and redirecting logistics and information flows in such a way as to ensure efficient production. He or she creates and maintains the necessary software that can simultaneously conduct several flows, taking into account situational changes in the operating mode, new data, the conclusion of individual stages for outsourcing, etc.

CROSS-PROFESSIONAL SKILLS

INDUSTRIAL ROBOT OPERATOR

A specialist in the management and maintenance of robotic systems, including complex and hazardous industries and when working with hard-to-reach or microscopic objects. Such specialists are needed right now, primarily for working with robotic manipulators and CNC machines (numerical control).

CROSS-PROFESSIONAL SKILLS

ADDITIVE TECHNOLOGY MACHINE OPERATOR

A specialist who knows how to work with machines of various types in additive manufacturing, which involves the layer-by-layer building of an object using computer 3D-modeling. In the modern industry, different technologies can be combined for this; for example, jet spraying, laser baking, etc.

CROSS-PROFESSIONAL SKILLS

DIGITAL ARTISAN

An entrepreneur, owner of the micro production of customized products. He or she is able to maximally and accurately understand what the client wants, offer him solutions and at the end, provide him with a product or a full digital model of the necessary product, which is enough to load into a standard production complex (for example, a 3D printing studio) to get the product "in hardware."

CROSS-PROFESSIONAL SKILLS
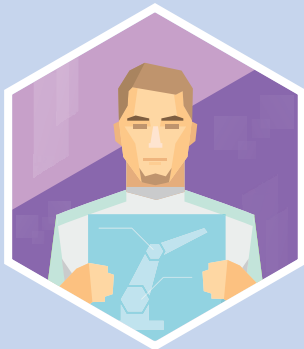
INDUSTRIAL ROBOTICS DESIGNER

A specialist in the design of robotic production devices (for operations such as painting, welding, packaging, stamping), production of logistics devices, such as loaders, conveyors, manipulators, as well as robotic systems from such devices, like automated plants.

CROSS-PROFESSIONAL SKILLS
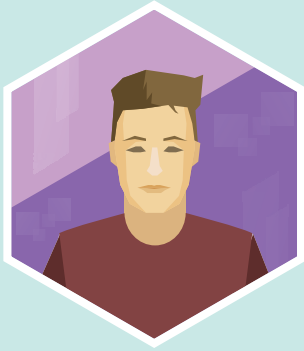
OPERATOR OF MULTIFUNCTIONAL ROBOTIC SYSTEMS

A specialist in the management and maintenance of robotic systems, including complex and hazardous industries, and when working with hard-to-reach or microscopic objects. Specialists are needed from now on.

CROSS-PROFESSIONAL SKILLS

FASHION INDUSTRY

Nika appeared in a dark room and immediately got entangled in hanging rags. She tried to free herself, but her leg got stuck, and the girl stretched out on the floor. At that moment, the switch clicked, and the room lit up with a bright cold light.

She ended up in a small room densely packed with clothes hangers. Near the walls, close to each other, were tables with large mirrors. Cosmetics, hairpins, and tissue samples lay mixed on tables.

"What are you doing here?" there was a displeased female voice, and only then did Nika pay attention to a lady in an asymmetric black and white dress who stood still in the aisle. A flock of mixed men and women peered out from behind her.

"What are you doing here?" repeated the lady, and Nika was utterly lost. For all her incredible journey, no one had asked her this question.

"I … Well …" the girl took a little more air into her lungs and honestly answered, "Actually, I'm from the past. You won't believe it, but I got a roborabbit here …"

"Hash!" the lady threw up her hands up. "I don't need your ridiculous excuses. Just next time, meet where they said: in front of the dressing room." She went into the room and sank into the nearest chair. The rest followed her.

"This also applies to you," the lady addressed them. "Take today's show seriously. The future of Maya depends on how everything goes!"

"Maya?" asked Nika.

"The fashion house you still work in," the lady said. She clapped her hands. "Let's get ready!"

Everyone set in motion immediately. Some rushed to the hangers; others went to the tables.

"Do you need a special invitation? You must be on stage in ten minutes!"

"You mixed up something," Nika smiled shyly. "I have nothing to do with this. In all parameters, I am not a model."

"What other parameters?" the lady asked irritably, watching the preparations with her eyes. "Do you think we live at the beginning of the century? Look at them. Who is here with model parameters?"

The girl followed her gaze. And really! Around them, there was not a single typical model that Nika would imagine. Instead, they were ordinary people: tall and short, fat and skinny, teenagers, and the elderly.

"Yeah, I was lucky to be born later," the guy next to her grunted. He waved with his left hand, and Nika noticed that a biomechanical prosthesis was coming from his elbow.

"Youth," the lady shouted at them, "chat less, do more. Come on, quickly put on your clothes."

The guy went to the hangers. Nika rushed after him. "I thought the dressers helped models put on clothes."

"Not this time." He ransacked the same beige things and handed Nika a flesh-colored suit. The girl looked disappointed at the new thing.

"I thought it would be a gorgeous dress. What kind of show is this?"

"Normal, just in augmented reality," the guy smiled. "Therefore, the clothes should not just shine. Well, don't worry," he looked into her eyes, "this is not the final show—it's just a demonstration. Big bosses must decide which direction to move."

At last! Maya has long lagged behind the rest. Well, at least the new CEO, Karina Lutz, finally decided. Now, they completely change their positioning. Well, the lineup.

"Makar, Makar Ivanov," the strict lady called out to the guy. "You're the second to go. Nika goes right after you. So, change clothes!"

"Okay, I go," the guy smiled. Turning to Nika, he said, "See you after the catwalk."

Nika smiled nervously and headed for the booth. All she could think of now was to collapse right on the catwalk.

"That's great, isn't it?" a cheerful chubby woman laughed next to her. She removed the gray strand of hair that had knocked out. "Who would tell me that I'll become a model in the sixties? And don't be shy, just be yourself, and everything will turn out fine."

Nika did not remember how she got out of the backstage, but the excitement disappeared as soon as she stepped on the podium. The girl confidently walked forward, trying to step with a model walk. She caught up with Makar and walked on, spun around her axis, and looked around the hall.

There were very few people. Only the front row was occupied. Everyone was wearing AR-glasses, which were already familiar to Nika, but they were no longer looking at the podium, but at the blonde in the center—probably the very Karina.

"So, why do you think this collection will be successful?" She asked a nervous man in plain linen shirt and similar trousers.

"You see," he said fervently, "now, ecology and reasonable consumption have turned around with might and main.

"This should be our credo: back to nature, to our origins! Look at Nika. The clothes have simple lines, natural colors … But there is also a twist. Pay attention to the African trouser print."

"What trousers?" Nika asked, furtively glancing down at the tight shorts and almost slapped herself on the forehead. Of course, they see augmented reality.

The girl turned to the backstage, and for a moment, lost her step. Behind her were huge monitors that broadcast what was happening. There she was, and there was a model following her. But only that she looked very different. Instead of tight-fitting skin-colored clothes, they turned out to be suits and dresses in sandy shades. Nika even managed to make out the African print, which the fashion designer was talking about.

"… Buyers will feel themselves to be part of nature, its inhabitants, and not the colonialists and invaders," the nervous man continued.

When Nika returned backstage, Makar was already waiting for her and tapped her shoulder encouragingly.

"What is happening there?" asked Nika. "Who are all these people?"

"I told you, today, our fate is being decided. And two offers got into the finals. Either we make a nature collection or hi-tech collection. You probably recognized the woman in the center. Inimitable Karina. And on the sides of it are fashion designers and their teams."

"What they are discussing is quite interesting. Let's go listen." Makar suggested. "Just be quiet!"

They slipped from behind the curtains, walked around the hall's perimeter, and found a spot at the end of the hall.

"The collection will be 85% biodegradable," the nervous fashion designer continued. "Naturally, we use only natural fabrics: cotton, linen, nettle, hemp. But also, for accessories and decorative elements, the designer of new organic materials develops environmentally friendly solutions."

"We plan to make the accessories out of propanediol," a woman seated on the fashion designer's right hand spoke up. "This is a biomaterial developed based on the fodder corn. And the decorative elements are made from eco-leather based on microorganisms."

"In addition, we consider it important," the brown-haired man in glasses added, "so that the clothes are comfortable. Therefore, we make sure that the fabric and silhouette provide the necessary ventilation and optimal heat regulation."

"The fashion for a healthy lifestyle remains," the fashion designer continued. "Therefore, we want to add sensors that read indicators of heart rate, respiration, heart rate, and sugar level."

"Will they not interfere?" asked Karina with a frown.

The brown-haired smiled. "Not at all! The size of the sensors is only a few millimeters.

"Who is he, a doctor?" whispered Makar to Nika. "No way! This is one of the coolest healthy clothing experts in the world."

"In addition," the fashion designer added, "We work closely with recycling specialists. For example, look here…" A girl in skin color clothes, like the rest were wearing, came onto the podium. Nika looked up at the screen, and the girl was wearing a simple but elegant cream dress. A veil adorned the head, and something like Cinderella's shoes flaunted on her legs.

"Shoes like glass," the fashion designer smiled. "In fact, we will make them from plastic collected in the oceans."

"Great decision," Karina nodded. "Just great …"

The designer smiled wryly and cast a triumphant glance at the team sitting on the other side.

Barely noticeable before smooth music suddenly broke off, and powerful beats sounded in its place. A girl with freckles and bright blue hair, like Malvina's, rose from the seat.

"I won't even argue. Ecology is an unrealistically important topic," said Malvina, "but to revive Maya, it's not enough to play on trends. You won't surprise people now. We need a wow effect so that everyone's jaw hangs." She waved her hand, and a woman appeared on the podium with whom Nika spoke behind the scenes.

Nothing unusual in reality, but on the screen, the model was dressed in an airy multi-layered dress, now and then changing color. The woman frowned—the dress turned orange, smiled—turned pink.

"Wow!" escaped from Nika. Malvina caught her eye and smiled.

"I propose to use technology to its fullest. Health sensors? Yes, they are in smartwatches. What about a dress that changes color to suit your mood? Amir, our specialist in visual effects, offers to integrate sensors in order to read human emotions."

The dark-skinned man next to her nodded.

"The technologist will create special biometric sensors for us, which we will place on the inside of the dress. They will read heart rate, respiration, and body temperature."

"According to them, we can predict the wearer's mood, transmit a signal to the outer luminescent layer, and turn into a suitable color."

"And we'll create the basis of the collection, not from whatever, but from smart fabrics with shape memory," added Malvina. "So, the dress will survive even the most frantic party."

The girl nodded to the man with a long black braid.

"This fabric does not crease—it always straightens into its original shape," he said. "Besides, it has water and dirt-repellent properties, so a cocktail spilled on a dress will not spoil it."

"If we want to enter the future truly, we need to show customers that we are not afraid of it," Malvina said, raising her nose. "We show that technology is good."

"Say it to Prada," the nervous fashion designer chuckled. "We heard that 3D models of the new collection of bags have already been published on the internet, so print as much as you want. And not a week has passed!"

"They shouldn't have saved on blockchain verification," Malvina shrugged.

"Thank you," said Karina, and all at once subsided. The nervous fashion designer squeezed his head into his shoulders.

Malvina plopped down on the seat.

Karina continued. "I agree, we need to enter the future. But the future is not only about us, but also about the future of the planet. Customers are increasingly drawn to the simplicity and reasonable consumption. Therefore, I propose to focus on a combination of eco-fabrics and simple cuts." The nervous fashion designer exhaled noisily and broke into a smile.

"But this does not mean that you need to abandon technology. Great idea with changing colors to suit your mood! What if we combine it with recycled plastic shoes?" She turned to Malvina. "Besides, I absolutely do not want your sketches to be in vain. So, let's add AR codes to the clothes. Look at the screen: this is a brilliant idea! One clothes, in reality, another on the smartphone screen. Moreover, in virtuality, you cannot limit your imagination, make customized options: even a burning dress, even wings behind your back."

"I was thinking about a burning dress," Malvina perked up. "Actually, I have a couple of sketches somewhere …" She began scrolling her phone.

"Well," Makar said, "I was hoping technologists would win …"

"In a way, they won." Nika smiled.

"Well, will you stay for the reception?"

The girl shook her head with regret: the robotic rabbit was waving with might and main on the catwalk.

TASK

Make up similar stories based on the following cases and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

● What can be called a team for each case? How many different specialists do you need to complete a task?

● What might look like a room where the heroes work?

● What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case 1. It is required to develop fashionable smart t-shirts that can diagnose cardiovascular diseases and transmit information to the owner's smartphone.

Case 2. You are asked to create a small automatic studio with a virtual fitting room and a robotic workshop, as well as with the possibility of repairing clothes.

VISION OF THE FUTURE

The trend for ecology has a great influence on the textile industry and, as a consequence, fashion: more expensive fabrics from natural raw materials (linen, cotton, viscose, etc.) are made from recycled clothes and replaced with new synthetic materials. In addition, there is a growing demand for high-tech smart fabrics—self-cleaning, luminous, or able to accumulate solar energy. For example, the Danish startup Organic Basics has developed underwear with antibacterial properties that can be worn for several weeks without washing—it is treated with silver chloride.

Another trend is the personalization of clothes. It appeared due to the growing repletion and exactingness of the consumer, as well as the development of small industries. Automation of tailoring reduces the cost of a single wardrobe item, and there are more and more single manufacturers.

Online ateliers and shops with the possibility of customization are also developing. The user chooses the color and finishing of jeans or orders a custom-made shirt to be sewn according to individual standards.

More and more consumers buy clothes in online stores, such as ASOS, Lamoda, Shopbop, Wildberries, Ali Express, etc. At the same time, it is often difficult to understand how the selected clothing will fit. Because of this, startups in "virtual fitting rooms" are popular. For example, Amazon is developing the Body Labs project, where you can create a 3D model for fitting based on several photos of the user.

3D-printing is becoming cheaper, and in the foreseeable future, 3D printers will be available to almost everyone. You can already download a drawing from the Internet and print a plastic decoration or a cover for your smartphone. Professional designers even create entire collections of clothes and shoes in this way. With the cheapening of production, intellectual property will become the main value—fashionistas will chase up-to-date 3D-drawings. To update the wardrobe, it will be enough to go to the website of your favorite brand or designer and download the "recipe" of your favorite dress. After that, you can go to an automated studio, upload the purchased pattern-blueprint to a special decryption terminal, adjust the future item to your size in a virtual fitting room, after which the clothes will be sewn in a robotic workshop.

The clothes of the future will be convenient and environmentally friendly, therefore, the demand for materials is growing, on the one hand, materials which are the most beneficial for health (warming, breathing, disinfecting, diagnosing various diseases at an early stage, etc.), and on the other, environmentally friendly (biodegradable or energy storage). For example, clothing from the Under Armor RUSH collection was created from an innovative fabric that acted on the athlete's body like an infrared sauna. Ralph Lauren has made smart T-shirts for the US Olympic team that can read the pulse, depth of breath, and other indicators and send them to the mobile application. First Warning Systems bra has created a bra that can detect breast cancer in the early stages, using special sensors to analyze jumps in body temperature.

Electronics, meanwhile, is becoming more miniature, and clothes are increasingly bizarrely combined with wearable gadgets. For example, at the Louis Vuitton cruise show in New York, the brand presented a bag model with small screens on the sides, and fashion designer Paulina Van Dongen embroiders dresses with solar panels.

High technologies not only make clothes more comfortable but also significantly expand the artistic possibilities of fashion designers. For example, the English chemist and textile designer, Lauren Bowker, created a dress made of fabric that changes color in response to fluctuations in light, heat, and humidity, and Philips introduced a "dress of the future" with biometric sensors that read emotions. It can change color along with the mood of its owner.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

CLOTHING RECYCLING SPECIALIST

A professional with knowledge in ecology and materials science, who develops optimal ways of processing old clothes and their recycling. For example, the Fair Harbor brand creates beachwear made from recycled plastic collected in the ocean.

CROSS-PROFESSIONAL SKILLS

HEALTHY CLOTHING EXPERT

He or she controls the production of clothing in terms of its safety and health benefits (thermal insulation, ventilation, etc.), and also develops clothes with medicinal properties—for example, fabrics with disinfecting impregnation. Sensors woven into smart tissue will take heart rate, respiration, sugar levels, etc., and then transfer them (for example, via wireless communication channels) to the user's mobile phone or directly to the physician.

CROSS-PROFESSIONAL SKILLS
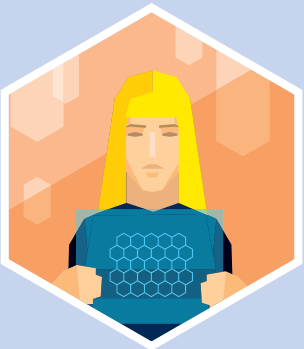
SMART FABRIC DESIGNER

A specialist who designs new synthetic fabrics and materials with desired properties (for example, LED fabrics or fabrics with shape memory). To create such fabrics,they use optical fiber, metals, conductive polymers, and other materials. Recently, designers have been actively using nanostructures for the modification and decoration of natural and synthetic fibrous materials. They give the product hydrophobic and antibacterial properties, protect the wearer from the negative effects of ultraviolet radiation, etc. Clothing becomes more wear-resistant and adapts better to temperature fluctuations, so seasonal differences in the wardrobe are erased.

CROSS-PROFESSIONAL SKILLS

TECH STYLIST

A specialist at the intersection of design and IT, who complements clothes with wearable gadgets both for purely decorative purposes and for solving certain problems. For example, there are paired "T-shirts for hugs" equipped with special sensors. If you hug yourself, they transmit information to your smartphone, and a person with a T-shirt "twin" will be able to feel the virtual touch.

CROSS-PROFESSIONAL SKILLS

NEW ORGANIC MATERIALS DESIGNER

A professional who creates new organic fabrics. Due to the trend for environmental friendliness, interest in textiles made from natural materials is growing. Now, in addition to the already known cotton, linen, viscose, wool, and other fabrics, new organic materials are being developed from other plants: nettles, bamboo, algae, hemp, eucalyptus, etc. For example, in 2017, the sports brand Reebok introduced NPC UK Cotton + sneakers Corn, which is 75% organic biodegradable components: the top is made of cotton, the sole is made of propanediol, a biomaterial developed on the basis of fodder corn, and the insoles are castor oil.

CROSS-PROFESSIONAL SKILLS

FASHION VISUAL EFFECTS SPECIALIST

High technology creates new opportunities for visual effects. Firstly, there is a demand for the creation of fabrics that change color as a result of external influences, and secondly, augmented reality comes into fashion. This means that artists who can come up with and model these visual effects will be in demand.

CROSS-PROFESSIONAL SKILLS

SMART CLOTHING REPAIRMAN

A specialist who is engaged in cleaning and repairing clothes from new materials and with built-in gadgets. Smart fabrics in operation are more capricious than ordinary ones: due to high-tech impregnations and electronic fillings, it will be more difficult to clean, iron, and repair them. Accordingly, new services will appear at the junction of laundries and ateliers, where it will be possible to hand over smart clothes for cleaning and repair.

CROSS-PROFESSIONAL SKILLS

BRAND BLOCKCHAIN AUTHENTICATION EXPERT

A specialist who marks the authenticity of fashionable clothes or accessories using blockchain technology. The tremendous possibilities of 3D printing at the same time carry a new risk of mass fakes in the fashion industry. A possible solution is to verify the processes of creating original clothes using the blockchain. Accordingly, specialists will be required to develop such protocols. For example, the fashion ready-to-wear brand Babyghost, together with the blockchain project VeChain, created a solution for protection against fakes, based on the use of NFC.

CROSS-PROFESSIONAL SKILLS

FASHION EXPERT ON ENVIRONMENTAL SAFETY

A specialist who creates a new ideology of consumption of fashionable products. He or she is responsible for the transition of the business from the "fast fashion" model (cheap low-quality goods, frequent updating of collections) to "slow fashion" (high-quality and expensive clothes, often made by hand, not tied to certain trends and collections). Such a specialist is engaged in the introduction of new technologies in production that minimize the negative impact on the environment and determines the choice of materials, etc.

CROSS-PROFESSIONAL SKILLS

LIGHT INDUSTRY IT-INTERFACE DEVELOPER

A specialist who develops programs for 3D-design of clothes, creating patterns, and virtual dressing rooms.

CROSS-PROFESSIONAL SKILLS

DEVELOPER OF ELECTRONIC RECIPES OF CLOTHES

An IT specialist who translates design sketches of clothes into instructions for a robot or 3D printer. In the future, the user can use them and print or sew clothes according to them in an automated studio.

CROSS-PROFESSIONAL SKILLS

CONSTRUCTION

The roborabbit descended dangerously close to the layout of the stadium.

"Watch out!" Nika tightened her legs so as not to touch the miniature spotlight. The robot landed in the middle of a football field. Grabbing the roborabbit with her hand, the girl carefully stepped over the stands and jumped to the floor. She wanted to express everything she thought about its methods to the robotic rabbit, but it had already disappeared. The girl irritably threw back her hair and looked around.

She was surrounded by layouts. A skyscraper rose to the left, an intricate bridge curved in front of it. Nika touched a slightly swinging stadium. The surface turned out to be rough, similar to gypsum, but all the small details were worked out with amazing accuracy. The girl looked closely, trying to understand how the details were glued but did not find any seams.

The door behind Nika opened wide, and a disheveled young man flew into the room. He looked at the girl suspiciously, grabbed a chair from the nearest wall, and sped off back. Loud voices were heard from the next room.

"You inflict a wound in the very heart of the city!" shouted a woman. "With your remarks, you kill the spirit of antiquity!"

Interested, Nika followed the voice and stopped at the meeting room's tightly closed door, and then she looked inside. The sounds came from there. A diverse group sat around an oval table.

On one side, there were two men in obviously expensive torn T-shirts and a thin girl in a voluminous dress. At the other, a gloomy balding blond in a gray suit and an older man with glasses. The familiar young man smiled nervously at the sight of Nika.

"What's going on here?" the girl asked him. He nodded forward.

A strict woman in a Victorian blouse and a pencil skirt stood at the monitor. Her face flushed red; the wisp squinted to the side.

"Vorontsov Manor is the cultural heritage of the sity of Ensk! You can't just take it and turn it into a booth.

"Not a booth, but public space," the girl in the dress snorted. "And the first in the city. I thought cultural heritage should serve people."

"Of course, of course," the blond replied. "The Department of Cultural Heritage primarily takes care of the aesthetic education of citizens. But when we agreed on the project, we did not think that it was so … uh … daring. Not that we are opposed, but the gentlemen and ladies from the World Heritage Committee are worried that …" He paused and looked at the stiff woman and older man sitting next to him.

"Yes, we are introducing an element of eclecticism," the girl raised her head. "But at the same time, we were preoccupied with preserving the facade and interior decoration."

The architect took a presenter from the table, clicked, and the image of a magnificent but dilapidated manor appeared on the monitor. Stucco hung on the walls in flakes. There weren't enough stucco patterns above the arched windows, though a crack went along the dome. The girl clicked again, and the image of the mansion was transformed.

"As you can see, visually, the facade will not change. We will recreate the stucco molding according to the original sketches using a 3D printer. The main changes will affect the internal layout, but we will try to preserve the interior details.

"At the same time, we will cover the walls with nanospray, which will protect the wallpaper and stucco from moisture and pollution. We will arrange the air conditioners so that they maintain the optimal microclimate for paintings and decoration. Our BIM manager has developed a project model at several levels."

One of the men in T-shirts, a short brown-haired man with a ponytail, rose from his seat. "The model contains all the levels of building design," the image behind him changed. It showed several schemes of the mansion. "The outer shell, the supporting frame, engineering equipment, and internal layout. In addition, you can see all the project documentation in the cloud, including estimates and operational forecasts.

"According to our estimates, the changes will reduce electricity consumption by 25%, improve the building's insulation by 17%, and, according to forecasts of the life cycle manager, the service life will increase by 1.5 times and the next reconstruction will be required only in 45 years."

The balding blond and elderly man stood up to better view the slides. Different 3D-models of the building succeeded each other: multi-colored lines of communications, a schematic model of the facade, and the lattice of the frame.

"Not so bad," the old man began, uncertain, and looked at the stiff woman. "Yes, of course, it's a pity that the authentic layout will disappear, but if the microclimate is better for preserving paintings and furniture, I think the sacrifice is justified."

"Fine," the blond breathed. "And saving energy is so wonderful! What do you say?" He turned to the woman from the World Heritage Committee.

She was still silent.

"What is it?" She finally asked, pointing to a model of the interior layout. The tone did not herald any good.

"It looks like an elevator," Nika answered.

"The elevator! In the building of the XVIII century!" the woman suffocated. "Are you crazy?"

"I don't know," the official squealed. "Is it standing out too much?"

"In my opinion, it fits perfectly into the design," the old man agreed.

"Does it fit? Yes, Vorontsov would have turned over in his grave from such a thing! And for this, you are going to destroy a magnificent staircase in the style of the Elizabethan baroque …"

"There is a second there," Nika shrugged, but quickly regretted what was said. It seemed that the woman from the World Heritage Committee was about to get a heart attack.

"I understand your doubts," a silent man in a T-shirt broke his silence, "but when I suggested adding an elevator, I thought …

"Why did you even think of this?"

"I am an accessible environment designer. And my main task is to make space for everyone, regardless of physical limitations."

"We used to work without it before," the woman snorted.

"People with disabilities used to stay at home," the designer said coldly.

"I do not think that we will agree…"

"At least look at how the center will look from the inside," exclaimed the BIM manager.

"And how do you show this to us? Pictures again?"

"Better … Much better. Come on!"

The room was empty: no tables, no chairs, not even some paintings on the wall, and cameras were hung around the perimeter around the ceiling.

"Here," the BIM manager handed the guests and Nika small darkened glasses.

"What is it?" the girl was surprised. The glass fits tightly to the skin, and as soon as the girl put them on, space around was transformed. Together with the rest, she found herself in an elevator.

The virtual reality turned out to be incredibly believable, not to compare with what the girl tried while visiting her friend. She looked at others. They almost did not change; only the facial expressions seemed a little strange. As if the facial expressions did not change so quickly, the glasses on them were gone.

"And where are our glasses?" Nika asked the BIM manager.

"We are in virtuality." He smiled. "The program captures the image using cameras and projects into the simulator. At first, we wanted to confine ourselves to a pillar of light or a conditional model instead of a person; it is much simpler, but it turned out that clients need to look in your eyes."

The elevator doors opened, and visitors found themselves in a spacious hall.

"So, you can go out and take a walk?"

"You are welcome…"

Nika made an uncertain step from the elevator and looked around. The antique furniture and painted ceilings coexisted with plasma screens. Pleasant music poured from the speakers under the ceiling. However, she could not volume down the rumble.

Throughout the space, back and forth scurried people, so similar to real ones.

A plump girl with pigtails escorted two elderly women to an audience labeled "Coding for Beginners," two teenagers examined ads on the touch panel. On the opposite side, on stage, a fair-haired man in a wheelchair quietly said something to two dozen listeners. "Peasants in Russian Painting," Nika read on the slide next to him.

Behind her, there was a childish laugh. The girl turned around, and her face stretched out in a smile. A young man with a "temporary nanny" badge met a new pupil. The kid was saying something enthusiastically to the man and did not even notice how mom and her friends went to easels by the window.

"When I was young, we left children with grandmothers," a woman from the World Heritage Committee said next to her. "Even through virtuality, it was clear that she was sternly casting her eyebrows."

"And how did it work?

"Disgusting. Mother herself worked. If she could babysit once a month, it was already salvation. So what kind of hobbies could be there?" She tried to run her hands over her face, but her glasses must have prevented her. The woman irritably grabbed the air in front of her and disappeared.

She took off her glasses; Nika guessed and followed her example.

After virtuality, the room was too quiet and empty. The rest continued to roam around the hall they virtually saw and looked like sleepwalkers.

"What happened?" the BIM manager approached the woman, taking off his glasses as he went. "Dizzy? Sick?"

That imperious gesture stopped him.

"I'm fine," she muttered. "Better tell me; in what time frame do you plan to complete your center? We expect that by the end of the year, we will send our employees to you. Are you sure that there is enough space, and you do not need to make another extension? I could talk to people in the department, and they will allocate a budget."

Nika looked at the flourishing BIM manager with a smile.

"We've got everything calculated," he said. "By the end of the year, we should complete it. As for the extension, you need to talk to the architect. Natasha!"

Familiar ears appeared behind the glass door. Nika cautiously squeezed toward the exit, walking around the remaining ones in virtuality.

"Next time, don't drop me anywhere, deal?" She asked the robotic rabbit. It hummed agreeingly, but the girl did not really believe it.

TASK

Create stories based on the following case study and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- What can you name the team for the case? How many different specialists do you need to complete a task?

- What might the place where the heroes work be like?

- What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. You need to design a building of the research base in the desert so that it is as environmentally friendly as possible, and sand should be used as the starting material for printing.

VISION OF THE FUTURE

Construction is one of the most important infrastructure sectors, providing economic development and everyday comfort of the population. This industry is one of the leaders in terms of the number of jobs in Russia. At the same time, construction has to be transformed to modern requirements. Changes in this area are taking place slowly, but gradually. New materials are being used in construction that is more environmentally friendly and budget-friendly in operation. This affects the design and architecture of buildings: for example, with the help of new materials, it is possible to create flexible and translucent structures.

Architects use bioplastics (it allows the construction of lighter and more environmentally friendly structures), aerogel for thermal insulation, concrete with the addition of carbon dioxide (this will allow the disposal of excess CO_2), flexible wooden blocks made of composites and even building waste. At the same time, the issue of waste management is becoming increasingly relevant: the planning of construction takes into account the volumes of future waste, its composition, and how it can be disposed of without harm to nature or reused.

Simulation technologies in virtual and augmented reality are already helping architects find a common language with the customer and make work on construction sites more efficient. For example, the Japanese Starbucks has redesigned 1,200 coffee houses using digital models. And Mortenson used augmented reality helmets during the construction of a medical center in Minneapolis. So far, the technology of building 3D printing is only gaining momentum. Still, more and more interesting projects are appearing on the market, and large world players (for example, Vinci and AECOM) are buying startups in this area. Professor of the University of Southern California, Behroh Hoshnewitz, created a layered printing method that enables construction of a building within 20 hours. The London architectural bureau Foster + Partners is working on a project for 3D printing of lunar houses, consisting of a metal frame and foamy filler, which will be made directly from the lunar soil.

Private houses are becoming more environmentally friendly and energy self-sufficient. There is such a thing as "zero-energy buildings," that is, buildings in which no more energy is spent than is produced. It is still difficult to achieve such a result; therefore, the "zero-energy building" term is used to describe houses where energy-saving technologies are used. The insulated foundation, walls with a multilayer structure made of composite materials, a plan thought out from the point of view of air circulation, solar panels on the roof, energy-saving lamps, and replacing the boiler with flowing water help reduce costs.

The urban environment is becoming increasingly accessible for people with disabilities. Their needs should be thought out even when planning construction, laying ramps, railings, elevators, thinking over the height of thresholds, etc. This applies to both residential buildings and department stores, schools, places of entertainment, and other urban buildings. In addition, more and more attention are being paid to public spaces for teamwork and leisure. Therefore, industrial zones will be increasingly actively rebuilt and turned into museums, coworking, creative clusters, etc.

CROSS-PROFESSIONAL SKILLS

1 Systems thinking

2 Cross-industry communication skills

3 Project management

4 Lean production

5 IT

6 Customer focus

7 Multilingualism/ Multiculturalism

8 Social skills

9 Working in uncertainty

10 Art and Creativity

11 Ecological thinking

CROSS-PROFESSIONAL SKILLS

ECO-ANALYST IN CONSTRUCTION

A specialist who analyzes the facilities being built in terms of their impact on the environmental situation in the city and helps construction companies choose the solutions that are less harmful to the environment and reduce construction waste. He or she is also looking for optimal solutions for the recycling of waste arising during the construction process. Unlike the life cycle manager, he works only at the design and construction stage.

CROSS-PROFESSIONAL SKILLS

3D PRINTING ENGINEER IN CONSTRUCTION

A specialist in the design and construction of buildings using 3D printing. He or she designs layouts of structures, selects components for their printing, plans, and controls the installation of fittings and communications with the help of robotic manipulators and accompanies the process of printing houses. Now, the closest profession is an additive manufacturing engineer. It is already in demand in the West.

CROSS-PROFESSIONAL SKILLS

REDEVELOPMENT SPECIALIST FOR INDUSTRIAL AREAS

A professional who is engaged in the reconstruction of "dead" industrial zones with a view to their more efficient use, including for the development of culture and tourism.

CROSS-PROFESSIONAL SKILLS

BUILDING TECHNOLOGY MODERNIZATION SPECIALIST

A professional who knows well modern technologies in the field of construction (for example, the use of structures made of new materials to modernize existing buildings and structures, the use of modern solutions for power supply, water supply, sanitation and air conditioning in offices, residential buildings, etc.), promoting them within the industry and introducing into specific projects.

CROSS-PROFESSIONAL SKILLS

SPECIALIST IN THE DEVELOPMENT OF NEW MATERIALS FOR CONSTRUCTION

A specialist in materials science, well versed in the needs of the construction industry. He or she models the properties of new materials that are suitable for construction and environmentally friendly, and predicts their life cycle. He or she uses digital models during development.

CROSS-PROFESSIONAL SKILLS

ZERO ENERGY BUILDINGS ARCHITECT

A specialist in the design of energy-autonomous houses that fully provide themselves with the necessary energy through micro-energy generation (alternative energy sources, trigeneration—the simultaneous generation of electricity, heat, and healthy cold) and the use of energy-saving materials and structures.

CROSS-PROFESSIONAL SKILLS

ACCESSIBLE ENVIRONMENT DESIGNER

A specialist who develops infrastructure solutions for children, retirees, and people with disabilities around the property (for example, playgrounds, elevators for people with disabilities, signs for the visually impaired, ramps, places to relax, etc.).

CROSS-PROFESSIONAL SKILLS

FOREMAN WATCHER

A specialist in construction who uses digital construction projects. He uses pattern recognition systems to evaluate the progress of construction and adjusts the construction process based on the result of data analysis.

CROSS-PROFESSIONAL SKILLS
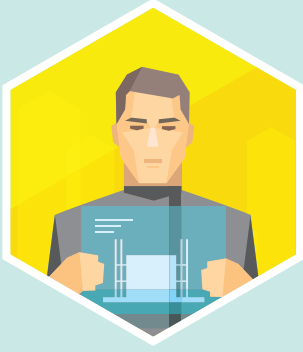
SPECIALIST IN REBUILDING AND REINFORCING OLD BUILDINGS

He estimates the degree of dilapidation of buildings or structures, selects new technological solutions (including the use of new materials) for their reconstruction and reinforcement. The profession becomes especially in demand during the restructuring and reconstruction of historical centers of cities.

CROSS-PROFESSIONAL SKILLS

SMART HOME INFRASTRUCTURE DESIGNER

A specialist in the design, installation, and configuration of an intelligent household management system (for example, household appliances, security systems, energy supply, water supply, etc.) Smart homes are step by step appearing now, and the demand for such specialists will grow in the coming years.

CROSS-PROFESSIONAL SKILLS

URBAN LIFECYCLE MANAGER

A professional who designs/evaluates and then monitors the state of the urban environment using IT tools. In particular, he analyzes and implements solutions that help minimize household waste, consume less resources (energy, water, etc.), improve the environment, and increase the availability of public goods. To make such decisions, he takes into account the complex social dynamics of the load on the infrastructure of the city (pendulum migration, holidays, etc.).

CROSS-PROFESSIONAL SKILLS

BIM MANAGER

A specialist working on the full life cycle of a facility under construction. He or she sets up and controls the design and construction team process using BIM (Building Information Model) technology. BIM-modeling is the creation of an information model of a building in which diverse information is collected and comprehensively processed: architectural, engineering, economic, etc., taking into account all the relationships. This allows specialists to consider different aspects of the project as a single system and use this information at all stages of its life cycle, from making design decisions and predicting performance to reconstruction or demolition. The jobs of BIM managers in Russia have already emerged, but as technology spreads, the demand for them will grow.

CROSS-PROFESSIONAL SKILLS

Personal investments plan

2035

FINANCIAL SECTOR

Nika ended up in a room with a rounded wall and a large panoramic window, beyond which stretched darkness, powdered with stars. In the distance, a nebula familiar from the lessons of astronomy swirled in a purple cloud. The girl started and grabbed the nearest chair, strange as if made of molten metal. Nika expected that she would fly up to the ceiling at any moment, but gravity remained in place.

"Hey, where are you?" cried Nika, looking around for the roborabbit. "That's too much. Bring me back to Earth!"

But the roborabbit had already disappeared.

The girl sighed frantically, wondering what to do next, but did not manage to come up with an idea. Voices sounded in the corridor, and a moment later, a group of people entered the room.

They moved suspiciously and did not resemble either aliens or astronauts. Most of them were wearing light shirts and t-shirts with jeans.

"Oh, Nika, you are already here," a curly-haired guy in tattoos nodded to her. "How did you get here so soon? Were there any traffic jams?"

"Traffic jams in space?" incredulously asked Nika.

Everyone smiled.

"Well, your interest rate on loans is quite cosmic," a dark-skinned woman with afro-pigs chuckled.

"Very mundane," the tattooed man added, smiling tightly.

"Wait, this is a bank?!"

"Have you fallen from the moon?" the man in a plaid shirt winked.

"We tie it up with cosmic jokes," the tattooed man shouted. "We have a serious agenda."

"Several clients have already complained about the incorrect behavior of the Finik, our digital financial assistant. For one client, Finik changed the distribution of expenses; for another one, he made purchases without a request. For a third, a failure in the assessment of eligible spending profile. And this is in one week!"

"But there are only three cases …" said Nika.

"Finik should be 100% safe. Any screw-up threatens us with a scandal on social media. And then, they told me that such errors are impossible per se." The guy pointedly looked at the others. Those embarrassedly crawled into their chairs.

"But who generally trusts a digital financial assistant to handle their money?" surprised Nika. "What if it's hacked, and your account as well will be?"

"A separate card is attached to it. It is not necessary to put all the money on it. Also, you can set a limit on transactions. But our customers rarely do this because Finik is safe. Or was safe so far. What happened?" the bank manager sarcastically raised his eyebrows. "Let's listen to the developer of automated services."

A woman with pigtails lifted her nose and stared at the tattooed guy. "We installed many updates to make the assistant smarter and more adaptive and connected new databases so that it can better calculate the optimal solutions. But Finik is programmed to act in the interests of customers — it is not able to make illogical expenses!"

"Well, maybe then it's about distributed ledger?" the bank manager turned to a gray-haired man with a loose beard, who had previously been silent — a bit like Santa Claus. Nika smiled to herself.

"Distributed ledger is inherently safe. All financial transactions occur only after consensus is reached between the participants; they are irreversible and are recorded at each stage."

"But still, please, check," the manager insisted.

"I have already. I have not found any features and suspicious moments in the logs; all the transactions that the clients talked about passed and were set by Finik."

"We suggested a hack at the internet of things," a woman with pigtails put in. "But our developer of M2M algorithms—"

"Wait a minute!" said Nika. "What is the internet of things? What is M2M?"

"This is when your smart refrigerator detects that there is not enough food, and it contacts an online store and orders food. And our financial assistant monitors how and what the refrigerator spends money on. Now machine-to-machine transactions — M2M — are about half of the cash turnover. In short, the M2M developer did not find any bugs. It seems that the problem is with the assistant itself. Therefore, I asked Zakhar,"—this is our cybersecurity analyst — to conduct tests on hacking the system.

"I only got a report an hour ago," a guy in a plaid shirt stood up. "There are no viruses."

"How, not all? What about code crashes?" The woman asked again.

"We ran the assistant through all the tests," the checker spread his hands. "It's neat and slick."

"So," the bank manager put his hands on the table, "if we do not know the problem, we will have to stop the project. We cannot take risks."

"We're missing something," muttered the woman with pigtails. "Will you show the files of the affected persons? More details are required."

"My guys interviewed the clients but found nothing that would lead to the trail," the manager sighed. "If you want, dig."

He poked a finger at the smartphone screen. Nika's phone was buzzing right there. A new file just arrived in her mail inbox.

"Case No. 1," the manager read from the telephone. "Vasily, 38 years old. He has been working in the "Indiana" travel agency for five years as a director of individual tours, and he is not married."

"Five years in one place? So long?" surprised, the woman with pigtails asked.

"Following the data on the client's lifestyle and tastes, Finik ordered delivery from fast food, but then subscribed him to Eat-Healthy.ru," the manager continued.

"Just like my mom," Nika interposed. "All the time, she is saying that I should eat healthily!"

The woman with the pigtails frowned. "And show me a photo of the client." She asked the manager.

"What do you mean?" asked the tattooed one. "That Finik forcibly put him on a diet? Have you created a fatshamer assistant? What an update!"

The developer dismissed him, went to her phone, and began to search for something.

"I searched the new base that Finik used," she said without looking up. "I removed the data that he requested for all clients, and highlighted health and nutrition-related issues. He requested an abnormally large amount of additional information about the association of excess weight with cardiovascular disease. It seems our client is sick."

"Does the robot have access to medical documents?" the manager was worried. "Lawyers will destroy us."

"No, of course not," the cybersecurity analyst reassured him. "It is against the law. But he has data from smartwatches, weights, a refrigerator, a computer, and a TV. Well, information on all purchases made, including pharmacy. He must have put two and two together and decided that the client was at risk."

"And replaced the junk food with more wholesome food? Wow!" Nika laughed.

"These are all speculations," the manager grimaced. "Perhaps your assistant just went crazy."

He sighed and dialed someone's number and put on the speakerphone. "Good afternoon, Vasily. You are talking to the bank manager. I hate to disturb, but it is important to ask you a personal question to investigate the program's situation. Tell me, have you recently visited doctors?"

"How did you find out?" asked a male voice.

"Something with the heart?" Nika badged in.

"Yes, but …"

"And the doctor said to eat better?"

Silence hung on that end.

"Wait a minute. Did you, therefore, decide to put me on a diet?" A male voice growled. "What the hell are you getting into?! I'll figure it out myself!"

Short beeps sounded from the smartphone.

"At least now we know what the matter is," said the developer.

"Does your digital assistant make decisions now?" Nika asked, sounding impressed. "Wow! Just like a real person?"

"It is far from a strong AI," the woman smiled flattered. "But yes, it studies and chooses the best solutions based on the client's data.

"What about the rest?" She turned to the manager.

"Case No. 2," the tattooed guy returned to the notes. "Natalya, 54 years old. Works as an environmental analyst. After the update, Finik bought her a salsa subscription and tickets to the Cirque du Soleil."

"Doesn't she like salsa?" asked the developer.

The manager frowned and scrolled the screen. "She loves it. She was engaged in it in her childhood."

"And what is wrong with the circus?"

"She likes the circus too. . . Said, uh… even enjoyed it. But she did not order these tickets!"

The woman with pigtails buried down in her phone. "Natalia recently got divorced, and after that, her profile has changed a lot. See, no cafes and movies, one food delivery to the office, even on weekends." She tapped her fingers on the screen. "Interesting … It seems that Finik was worried about her extra working hours. They are inefficient from a financial point of view, so it decided to diversify leisure. Clear. What is the third?"

The manager opened his mouth to say something, but waved his hand and read:

"Eldar, a programmer. Changed work and left the banking sector for the gaming one. Finik replaced his subscription to magazines: instead of financial ones — gaming ones."

"I know!" Nika rejoiced. "This is to better integrate into the team.

"Surely," the developer supported her, "creating games is impossible on your own. One who does not communicate with colleagues is unlikely to show good results.

"I see," the bank manager said gloomily. "I have to roll back the update. This assistant is allowed to do too much. Customers will be furious."

"Not at all necessary," retorted the woman with the pigtails. "I think that many will like that someone will monitor their effectiveness. Yes, I'll have to modify it.

"We will make several levels: automatic changes, with confirmation, and the absence of changes without the knowledge of the owner. But I am sure that many will gladly shift the responsibility to a program with almost unlimited access to scientific research, books, and articles." She grinned and added. "In the end, Natalia liked the Cirque du Soleil."

"Aren't you afraid that robots and programs control everything?" Nika asked quietly when they, together with the developer, were the last to remain in the office. "Aren't you afraid that they will take over the world?"

"You know," the woman said, "so far, the whole story says that it is people who make mistakes." She smiled. "Here, look how pretty!"

Nika followed her gaze and smiled at the sight of the robotic rabbit hanging in the air. "This is mine," the girl said proudly, stroking the robot's ears. "I'm sorry, I thought you sent me into space," she whispered to the roborabbit. "You would never do that!"

TASK

Come up with similar stories based on the following cases, the vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the place where the heroes work be like?

- What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case 1. A fund for investing in talented people wants to invest in Andrei, a young fifteen-year-old prodigy biologist. Andrei externally graduated from high school and is going to university; he wants to study biotechnology. We need to understand how best to invest in the education and career of a future scientist so that it brings great profit to the fund.

Case 2. A well-known inventor wants to evaluate his intangible assets in order to sell part of them, and invest the money received in some profitable start-ups and thereby secure his retirement savings. But he wants to invest only in eco-friendly projects.

VISION OF THE FUTURE

The financial sector is an economic system that helps regulate the redistribution of capital, directing it to the projects most demanded by the market. The general trend in the new economy is a decrease in the number of human intermediaries and their replacement with intelligent automated systems.

Therefore, many professions in the financial sector (such as an accountant or an operator) fall into the ranks of retirement professions and will number of jobs there will decrease in the coming years.

Automated financial services are divided into two main categories: digital consultant for the mass user and AI assistant for professional trading on the stock exchange. The services of an automatic financial adviser are already offered by Yandex (Yammi) and FinEx ("Financial Autopilot"). AI is used to create banking investment services (for example, "Simple Money" from Sberbank).

In addition, there are special programs for trading on cryptocurrency exchanges (for example, Cryptotrader).

Nevertheless, the sphere of finance can give room for creativity and original thinking where it comes to financing large or innovative projects, risk insurance, the development of new pension savings instruments, etc. In addition, thanks to the internet, new financial instruments, such as crowdfunding and crowd investing, new currencies based on digital codes (cryptocurrencies) are developing on the web.

Financial transactions will increasingly be carried out using distributed ledger technology — these are IT technologies for the secure contractual exchange of tangible and intangible (reputation, know-how, data, etc.) assets. For example, they can be used to track supply chains from manufacturers (noting all financial and operational problems), consumers and investors can track the origin of a product, its environmental friendliness, ethics, etc. Investors will increasingly take care of the environmental track of startups in which they invest.

With the spread of the internet of things, machine-to-machine transactions will develop — gadgets will be able to send money to each other without human intervention. For example, a smart coffee maker connected to an electronic wallet can order coffee from an online store if it understands that the supplies are coming to an end. Gradually, more complex processes will be automated. All this means that the requirements for cybersecurity will increase, because, with the growth of automation, new types of vulnerabilities also appear. Even the transition from the usual method of using a bank card to PayPass (a contactless payment system, for example, using a phone) creates new threats: it becomes more profitable for fraudsters to hack mobile applications.

More and more transactions are based on the exchange of products or the use of local currencies. In the future, more and more diverse tokens will be produced that encourage specific behavior. A token is a part of the cryptocurrency, a form of a digital asset (something like chips in a casino or loyalty points on a club card of a brand. You can exchange them for money, purchases, or services if you wish). However, they cannot be faked, and all transactions with them are verifiable. Sometimes, young startups issue tokens that work as stocks. By purchasing such tokens, you can finance a startup, and then exchange them for the services of this startup or a share in its capital.

The old approach to pension contributions ceases to work because people are increasingly working on freelance (and, accordingly, employers do not pay for them in a pension fund), and everybody retires later. So, there is a growing demand for individual investment plans in pension funds. Such solutions are now offered, for example, by Sberbank and Gazprombank.

CROSS-PROFESSIONAL SKILLS

1 Systems thinking

2 Cross-industry communication skills

3 Project management

4 Lean production

5 IT

6 Customer focus

7 Multilingualism/ Multiculturalism

8 Social skills

9 Working in uncertainty

10 Art and Creativity

11 Ecological thinking

PERSONAL RETIREMENT PLAN DEVELOPER

A specialist who develops models of personal investments in pension funds and other financial instruments, depending on the level of income, type of professional activity, lifestyle, and lifestyle expectations of old age.

CROSS-PROFESSIONAL SKILLS

CROWDFUNDING AND CROWD INVESTING PLATFORM MANAGER

A specialist who organizes the work of crowdfunding platforms, evaluates projects that apply for public funding, and regulates conflicts between project holders and those who support them. The first vacancies in this field already appear in Russia, both at the largest crowdfunding venues (Planeta.ru, Smipon.ru, and Boomstarter.ru), and in charity funds. By the way, the third edition of the Atlas of Emerging Jobs, which you hold in your hands, was funded with crowdfunding on the Planeta.ru platform.

CROSS-PROFESSIONAL SKILLS

DEVELOPER OF AUTOMATED SERVICES FOR MANAGING PERSONAL FINANCES

A specialist who develops and improves software that allows users to effectively manage their wealth. To do this, people consultants are becoming less and less needed. With many financial management solutions, AI is more capable to build integrated mathematical and statistical models.

CROSS-PROFESSIONAL SKILLS
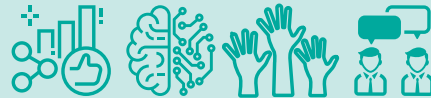
MACHINE-TO-MACHINE ALGORITHM (M2M) TRANSACTION ARCHITECT

A specialist who thinks out optimal algorithms for financial transactions on the Internet of things, excluding people from the process (but taking into account user preferences).

CROSS-PROFESSIONAL SKILLS

FINANCIAL SECTOR CYBERSECURITY ANALYST

A cybersecurity specialist with a focus on finance. Such an employee, among other things, perfectly understands the risks associated with the automation of personal finance management, inter-machine transactions, and cloud solutions, and is able to find vulnerabilities in smart contracts.

CROSS-PROFESSIONAL SKILLS

DISTRIBUTED LEDGER ARCHITECT

A professional who creates complex projects using distributed ledger technologies in various sectors of the economy. Today, distributed ledger technologies are used not only in the financial sector but also in other industries. In Russia, a course in this field of knowledge can be taken, for example, in Skoltech.

CROSS-PROFESSIONAL SKILLS

DISTRIBUTED LEDGER DEVELOPER

An IT professional who maintains a distributed ledger and resolves bugs and vulnerabilities.

CROSS-PROFESSIONAL SKILLS

INTELLECTUAL PROPERTY EVALUATOR

A specialist who determines the value of intangible assets, such as ideas, business models, inventions, material and social technologies, etc. This profession already exists in Russia, and the demand is growing every year.

CROSS-PROFESSIONAL SKILLS

GREEN FINANCE AUDITOR

A specialist who conducts a comprehensive assessment of the compliance of investments with criteria and evaluates credit risks in terms of environmental impact.

CROSS-PROFESSIONAL SKILLS

MULTICURRENCY CONVERTER

A specialist in organizing exchange systems for traditional and alternative currencies. There are already online services where you can exchange bitcoins to WebMoney or transfer to a regular bank account in your own currency (for example, alfacashier.com).

CROSS-PROFESSIONAL SKILLS

PRIVATE EQUITY FUND MANAGER FOR TALENTED PEOPLE

A specialist involved in the formation of a "portfolio" of talented specialists in need of financial support. He or she accompanies their educational and career paths in order to maximize their income and, accordingly, the fund's income (based on business models of movie star agents and young athletes).

CROSS-PROFESSIONAL SKILLS
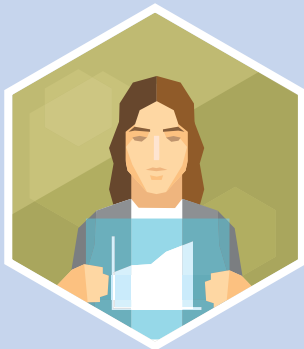
INDIVIDUAL FINANCIAL TRAJECTORY DESIGNER

A specialist calculating the model of personal investment, based on the planned income-expenses. He gives recommendations on family and personal budget planning, career development, etc. The profession of a personal finance consultant already exists in the Russian market. Still, taking into account the fact that more and more perform several assignments at a time, including those related to foreign projects, sources of income will become more diverse, and the planning of the budget will often require the help of a specialist.

CROSS-PROFESSIONAL SKILLS
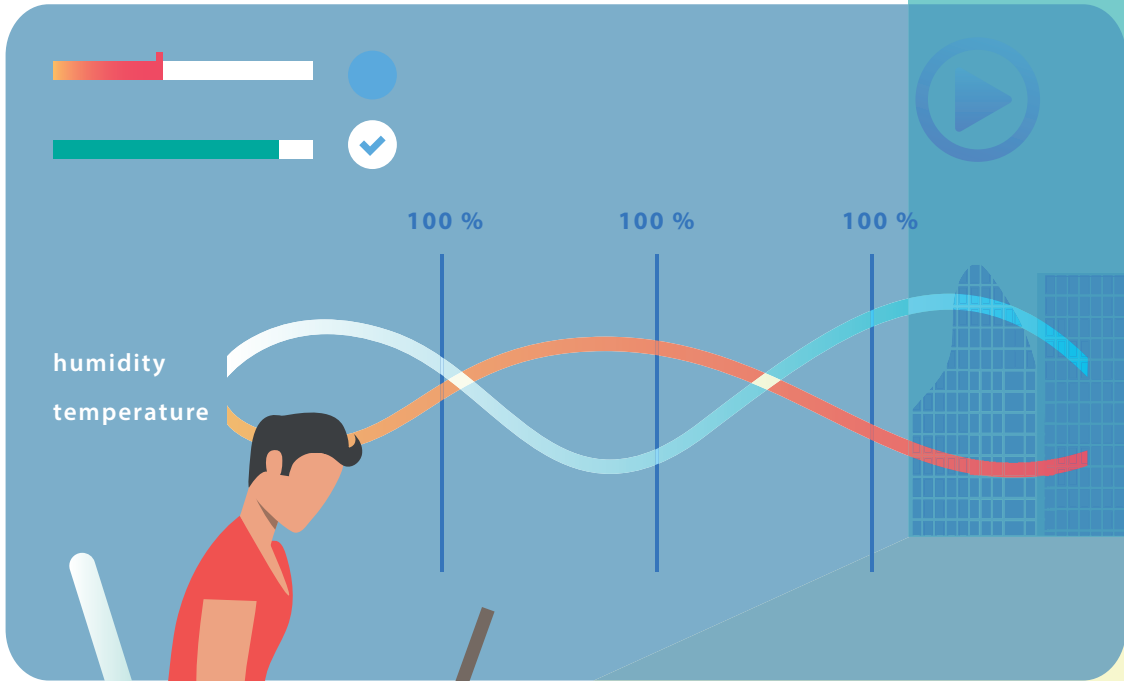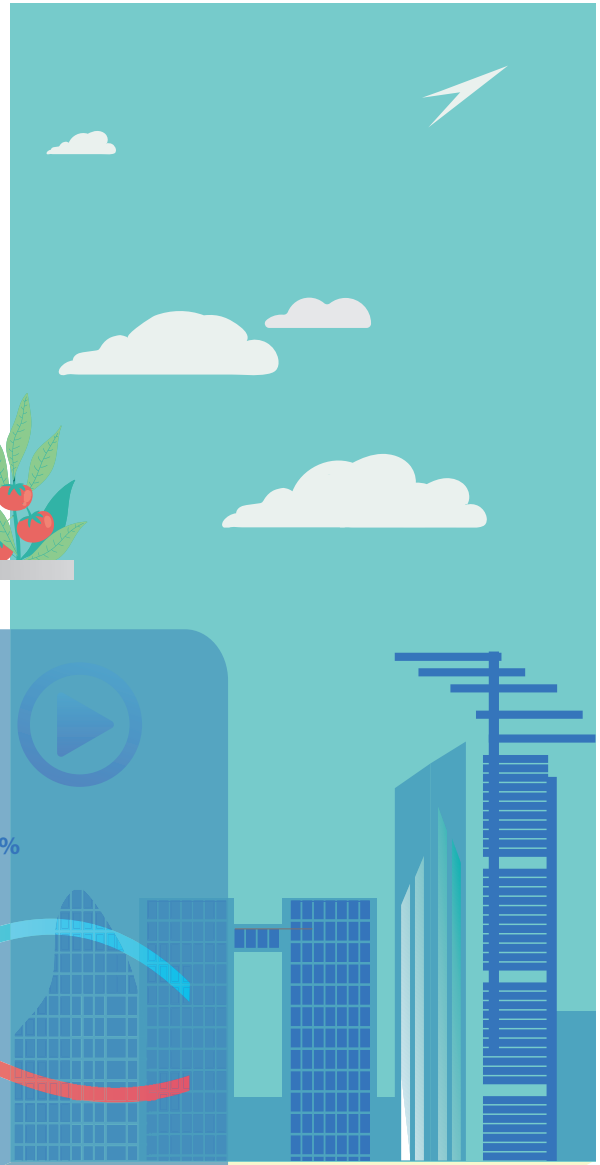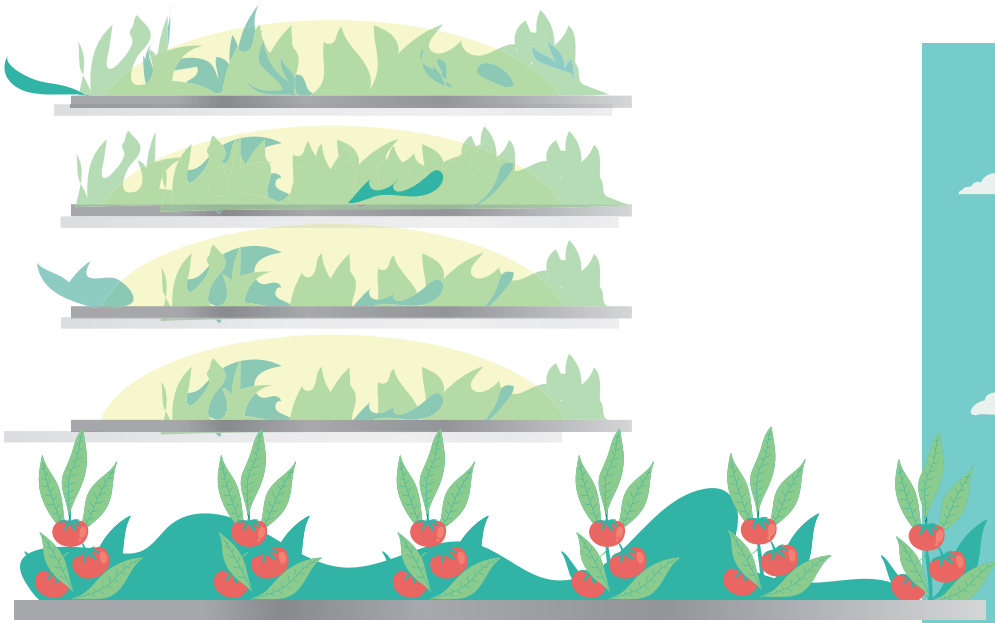
BIOTECHNOLOGIES

Nika realized that she was hanging in the air at a decent height. Legs dangled without any support.

"Mommy!" From surprise, she released the ears of the robotic rabbit and, screaming, flew down screaming.

Nika flopped into something soft and rustling. The smell of fresh herbs hit her nose. Somewhere nearby, water flashed, and cool drops fell on Nika's face.

The girl opened her eyes and raised her head. It turned out she was lying in the middle of a large garden. Lettuce, thick shoots, soft moist earth, everything around her was very reminiscent of a grandmother's cottage.

Garden? No, rather, a vegetable garden, Nika thought.

She got up, brushed herself off, took a couple of steps, and felt that the soil beneath her had moved. It seemed that the beds were tired of being in one place, and they decided to crawl somewhere. Nika jumped over several rows of vegetables, separated by small transparent partitions, and ended up on the most ordinary concrete floor.

Turning around, Nika saw a strange sight. The bed on which she landed did not crawl; it moved in a circle. The room was filled with beds, seed plots and hotbeds located in an ideal circle. The whole circle was large enough to occupy the middle suburban area.

As the giant garden rotated, all sorts of things poured on top of it: jets of water, dense gaseous substances, hissing jets of smoke with the smells of fresh earth.

Looking up, Nika saw that a huge web of hoses, tubes, sprayers and spray guns was hanging down from the ceiling of the room. And under the girl's legs snaked thin transparent wires and tubes through which some liquid mixtures flowed into the compartments of the garden. Nika assumed that this was liquid fertilizer for plants.

With a hiss, an automatic door opened. A young woman with a short dark haircut and a discreet nose piercing walked into the aisle between the artificial beds. Seeing Nika, she waved her hand.

"Hi! I am Agnia. Agnia Golukhova."

"Nika. And… where am I?"

"Second UPA of the North-Western District," Agnia answered and pressed the black pedal to the floor.

"UPA?" Asked Nika.

At this moment, the floor in front of Agnia moved apart. A thin, elegant platform with a monitor and a computer keyboard appeared from somewhere in the underground depths.

"Urban and peri-urban agriculture," Agnia explained, "and I'm a city farmer* in it. I look after it. Now, we will consult on the annual plan. Stay and listen."

Nika nodded silently. Since she began travelling with the roborabbit, she had already seen a lot, but such a mixture of country beds and sophisticated technologies was still unusual.

Agnia typed in a few keyboard commands. A few square frames appeared on the monitor, similar to Skype avatars. Nika guessed that Agnia was creating a group video chat.

One by one, the faces of three people appeared on the screen.

"Hi guys," Agnia said. "Is the connection ok?"

"Your spray gun 3.5 has stopped," a young man in a cap of fine wool said abruptly. Under his avatar, the post "Synthetic Biologist" shone.

"Oops, one second."

Agnia tapped on the keyboard, finally dashingly tapping the 'Enter' key with her finger. A pair of thin metal manipulators descended from the ceiling to a faulty atomizer and twisted something. The atomizer cheerfully puffed milk-white gas on the blackberry thickets floating below.

"Well, can we start now?" asked from the other end of the screen a tall man with a thin trimmed moustache. Even from the video chat screen, one could see how tall he was — a real tower. Under his avatar was "Architect of living systems."

"That's right, Philipp Andreyevich." Agnia nodded.

"Protocol: turn on …" muttered Philipp Andreyevich. "The record of the protocol is on. Getting started." He ran his fingers over his moustache. "Well, fellows, the first thing, the berries."

"The graphs are ready," Agnia answered right away and snapped a pair of keys. A three-dimensional model of the entire room and a web of pipes and hoses hanging over it appeared on the screen.

"If we increase the intensity of watering and nutrition in sections three and five, the rate of cultivation of blueberries, blackberries and strawberries will increase by 30% by the end of the quarter," she said confidently.

"Stop-stop, but how much energy will it take?" Philipp Andreyevich displayed several colourful graphs. "Damn. Do not pull. MFC will not produce so much."

Nika found herself holding a raised hand for a couple of seconds, as in a lesson. It's funny. This wasn't a school. Want to be answered, ask — don't wait. "Why bother to grow berries in the city?"

The faces on the screen turned to her.

Philipp Andreyevich smiled affably. "Great, an intern! You see, every year, there are more and more people on the planet. And everyone needs to eat. If we grow food in nature for eight, nine, ten billion people, what will happen to nature?"

"Exhaustion?" Nika suggested.

"Exactly. The planet will simply suffocate. In addition, having your own fruits and vegetables means less logistical difficulties. Therefore, food is now being grown in cities as well."

"What is MFC?"

"Microbial Fuel Cells. Waste from our farm goes to feed special bacteria. They process organic waste into electricity. We have a farm, consider it self-service."

"Philipp Andreyevich, still about the berries," a synthetic biologist in a woollen hat called out. "Why increase the yield?"

"It is necessary to strengthen the nutritional value of each berry, and that's it!"

The guy seemingly controlled the computer very quickly: DNA structures, three-dimensional models of berry fruits, and symbols of chemical elements flickered on the screen. Nika marvelled by the way in which the chat participants managed to follow all that.

"The berries themselves are not the important part," the "cap" rumbled. "Vitamins and acids are important, you need this stuff! Therefore, we correct genes in wild strawberries, increase

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* You can read more about the profession of a city farmer in the "Agriculture" section.

the proportion of vitamin C. And in blueberries, we add useful leucine and valine amino acids. There will be as many berries, but the nutritional value of each individual berry will be higher. Voila!"

"Kirill, wait a minute," the stern-looking woman in glasses with a thick black frame intervened. Her profile picture read "Security engineer."

"This is still a theory. These berries have not been tested anywhere. What will happen to consumers when they eat your raspberries is unknown."

"I… we have done GMOs many times, and there was no side effect!" Kirill roared. "In addition, digital models proved to be first-rate, Julia!"

"This does not mean that you don't need tests this time," Julia adamantly said. "We are not getting marks here. We are responsible for the health of the people who consume our product."

"You guys argue about nothing," interrupted Philipp Andreyevich. "Firstly, if new fruits are brought out, then a new watering and feeding regimen is needed for them."

"I'll take care of that," said Agnia.

"Well, so while Agnia adapts the program to a new regime, you, Kirill, please, provide the tests of your creations to the laboratory. After that, and only after that, will we send them to clinical trials. Is this clear?"

Kirill and Julia silently nodded.

"Nice. Next question," Philipp Andreyevich glanced aside at data only visible to him. "Regarding your mushrooms, Kirill, we need to test them."

"Exactly!" Kirill lit-up. "We will check them in action. I propose a plan to infect a patch with dioxins. Let's see how they—"

"Wait, stop," Agnia intervened. "Dioxins here? And if they get into the air? Or into the water?"

"Excuse me, what are dioxins?" Nika barely managed to wedge into the argument between the biologists.

"These are super stable toxins, organic pollutants," Kirill explained. "I… we are now introducing a new type of mushroom that can remove them from the soil. This is called bioremediation, when living organisms clean your soil, water, or air."

"By the way, since we remembered ecology," Agnia said, "we have a situation with beets. Are packers still requiring more beets?"

"Not even an hour goes by without them asking for more," Philipp Andreyevich confirmed.

"Beetroot packaging?" Nika could not understand.

"Well, yes. We make packages from beet waste, similar to plastic ones, which are also waterproof and durable. Pure plastic takes a hundred years to degrade, and a beetroot bag takes two to three months."

"Well," Agnia continued with pressure, "if we expand the beds for beetroots, then I will again have to rewrite the feeding program. And where will I squeeze the infected bed into this program?"

"And if you try it right away on living soil …" Kirill thought aloud.

"Kirill, Strangelove!" Julia said in a way that almost sounded like a threat.

"Why Strangelove?"

"Yes, because this is not experience-based, but a random try. How can you track down on living soil how your mushrooms interact with it?"

"Here, we have a controlled environment, and you can put sensors in the end! Therefore, so far, only laboratory tests."

"Well then, you suggest where it is."

Silence reigned briefly.

Philipp Andreyevich clicked something on his keyboard, and a three-dimensional transparent model of a tall building appeared on the screen.

"Let's do this logically. Here is our farm. All floors from the fifth to the fifteenth are occupied by food flora, and, I agree with Agnia, the main thing is for us not to spoil the soil."

Part of the building on the model highlighted in red.

"And the floors from the first to the fourth are reserved for private offices and utilities. I don't know about you, but I don't want to grow champignons in the toilets. And I don't want them in my closet either."

Now, almost the entire model had turned red, in addition to a rectangular room located somewhere under the base of the building.

"Only the basement with MFC remains. There we can cram our mycelium. If we set aside, say, this square …" Philipp Andreyevich enlarged the image of the basement and highlighted part of the model. "I can start the calculation of energy costs." On the screen, one after another, several charts surfaced. "You are welcome."

"Can't you allocate a larger area?" asked Kirill.

"With this new area of garden, our MFCs still cover electric costs. Going beyond it would mean the end of self-service. Or solar panels will have to be additionally installed. But we are not in radiant California, to say the least."

The zealous biologist reluctantly nodded.

"So, to summarize. Agnia, Kirill, we are preparing new berries in a collaboration — Kirill provides tests, Agnia provides a program. Julia, you will process the tests and check for safety for the consumer. For the mushrooms, the same thing. Agnia, Kirill, do the dioxin beds together."

"Only so that it is isolated from MFC," the security engineer grunted in. "And then dioxins will break our entire energy network."

"Naturally, everything will be in an isolated container. I will contact Anton, and he will allocate a place in the basement. Any questions?"

Everyone shook their heads.

"Then that's it for today. Get to work. End of protocol," Philipp Andreyevich commanded the computer. A second later, his avatar disappeared from the screen. All the other faces disappeared one after another.

Agnia disconnected and pressed the pedal on the floor again. The platform with the monitor and keyboard drove down and disappeared into the floor.

"Well, intern, do you have any questions?"

Nika smiled. "Yes, a lot, of course. . . but I'd rather think about them myself."

"Then, you go think, and I will deal with mushrooms and berries." Agnia turned around and walked out through the automatic door.

Nika found her robotic rabbit in a thicket of lettuce. It curiously sniffed the lush green leaves with its mechanical nose.

"Yeah, there is nothing like this at home." Nika grabbed the roborabbit by its ears.

The world narrowed down to a bright, sparkling tunnel and spun, spun, and spun…

TASK

Make up similar stories based on the following cases and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- What can be called a team for each case? How many different specialists do you need to complete a task?

- What might be like a room where the heroes work?

- What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case 1. You are asked to figure out how to replace packaging for a luxury cosmetic cream with environmentally friendly solutions. The problem is that the packaging should look beautiful and expensive. Otherwise, customers will not want to take the cream.

Case 2. It is required to create a bioreactor for a tissue engineer (see the chapter "Medicine") in order to grow artificial organs in it from stem cells. For organs, a framework of biocompatible material is required, which the tissue engineer will fill with cells, and the bioreactor creates and maintains the nutrient medium necessary for cell life.

VISION OF THE FUTURE

Until recently, the biotechnology industry was relatively poorly developed in Russia, and it was significantly behind most industrialized countries.

Nevertheless, this industry is one of the most promising: over the next decades, it will not only develop itself but will also radically affect other areas: medicine, energy, production of raw materials and materials, urban and agriculture. Biotechnology allows the use of living systems to solve various problems of humanity.

The pursuit of maximum environmental friendliness, the development of genetic engineering, and the ability to simulate many natural processes on a computer lead modern science to promising discoveries: new energy sources and organic electronics, biodegradable materials, and gene reprogramming. Often biotechnologies make it possible to find new solutions at the intersection of industries. For example, energy and microbiologists are jointly developing biofuels.

One of the most important areas where new biotechnologies are coming is the food industry. Technologies for the processing and reuse of organic waste are being developed. It is also possible to produce animal feed from waste using extrusion technology (raw materials are exposed to high temperature and pressure for a short time). This helps to increase the nutritional value and digestibility of the feed.

Biotechnology also helps new energy. For example, it is possible to produce a new generation of biodiesel from green microalgae, especially since they grow rapidly and can be grown directly in enterprises. In addition, it is possible to directly generate electricity from waste without first turning it into biogas, using devices called microbial fuel cells (MFCs). In these elements, the energy of bacteria that break down organic matter is converted into electricity. Unlike other alternative energy devices (such as solar panels and windmills), MFCs can operate at any time and under different conditions.

Attention to environmental problems stimulates the transition to packaging materials from biodegradable polymers that are not harmful to the environment (usually, they decompose into carbon dioxide and water). The goal is to ensure that the material is both environmental and consumer-friendly (durable, waterproof, etc.). Biopolymer packaging can be made from lactic acid, starch, cellulose, etc.

One of the most exciting areas of biotechnology is "intentional biology." This is a branch of biology, perceiving biology as a kind of code that can be hacked and researched and modified for your own good. Inside it, there are two key industries: biomimicry and synthetic biology.

Biomimicry perceives nature as a source of inspiration when creating new products, structures, and processes. Over the past decade, it has influenced a wide variety of industries, from robotics to management. There are three more directions inside it: new materials imitating organic molecular structures (physicists, chemists, and nanotechnologists work together), biomechanics (copying natural motor systems, for example, when creating cyber prostheses or robots that can move like living creatures) and artificial ecosystems (for example, in urban farms).

Synthetic biology is aimed at changing existing living organisms and creating new ones. For example, scientists from UC Berkeley taught the bacterium to produce a substance that helps against malaria (artemisinin), which significantly reduced the cost of its production.

Another area is the work with diatoms, the cells of which are covered with a kind of micro silica made of silicon dioxide. Designer diatoms can be used as filters or substrates (the basis for cell growth), on which, for example, artificial human tissue can be grown for future implantation. Work is underway on bacteria that can feed on plastic and thus fight pollution. You can also make organics glow or change color under certain conditions — that is, say, turn a plant leaf into a living sensor.

For example, the American Advanced Plant Technologies project is dedicated to this—the creators hope that genetically modified plants will be able to report pathogens and radiation.

CROSS-PROFESSIONAL SKILLS

1 Systems thinking

2 Cross-industry communication skills

3 Project management

4 Lean production

5 IT

6 Customer focus

7 Multilingualism/ Multiculturalism

8 Social skills

9 Working in uncertainty

10 Art and Creativity

11 Ecological thinking

DEVELOPER OF BIOCOMPATIBLE AND BIODEGRADABLE MATERIALS

A specialist working at the intersection of materials science and biochemistry. He or she creates biodegradable polymer materials that can decompose into environmentally friendly substances and biocompatible materials that can be used in medicine for the development of cyber prostheses and the cultivation of artificial organs.

CROSS-PROFESSIONAL SKILLS

SYSTEMS BIOTECHNOLOGIST

A specialist in replacing obsolete solutions in various industries with new products of the biotechnology industry. For example, he or she will help industries switch from petrochemical raw materials to raw materials from renewable sources. Transport companies will switch to biofuels instead of diesel, and construction companies will switch to new biomaterials instead of cement and concrete.

CROSS-PROFESSIONAL SKILLS

MFC DEVELOPER

A professional who develops microbial fuel cells. In Russia, MFC technologies are involved, for example, in Novosibirsk, at the Federal Research Center (FRC) "Institute of Catalysis SB RAS".

CROSS-PROFESSIONAL SKILLS

BIOCHEMICAL ENGINEER

A specialist engaged in the creation of new equipment, robotic systems, and software for biotechnological and medical laboratories. It combines expertise in both the natural sciences and systems engineering. In addition, he will need experience with medical data to use databases of medical experiment results.

CROSS-PROFESSIONAL SKILLS

SAFETY ENGINEER IN A BIOTECHNOLOGICAL PRODUCTION

A specialist responsible for the safety of the biotechnological production process and the quality of the product (primarily in the food industry and medicine). In addition, he or she oversees waste minimization. There is an increasing number of closed-loop non-waste industries, where organic waste is disposed of, processed, or used to generate electricity (microbial fuel cells).

CROSS-PROFESSIONAL SKILLS

SYNTHETIC BIOLOGIST

A professional who designs and creates biological systems with desired properties for use in medicine, veterinary medicine, agriculture, and the food industry. In particular, it creates synthetic enzymes and peptides that are used in cosmetics, pharmaceuticals, dietary supplements, etc.

CROSS-PROFESSIONAL SKILLS

LIVING SYSTEMS ARCHITECT

A specialist in the planning, designing, and development of closed-loop technologies involving genetically modified organisms and microorganisms. Such a professional will be indispensable in autonomous cities. He or she will calculate the necessary capacity of bioreactors, develop projects for urban farms, and carefully consider the waste management system.

CROSS-PROFESSIONAL SKILLS

BIOPHARMACOLOGIST

A specialist in the design of new biologics with desired properties or in the replacement of artificially synthesized drugs with biologics. Already today, a number of important drugs — for example, penicillin and insulin — are produced using genetically modified bacteria.

CROSS-PROFESSIONAL SKILLS

Business trip
to Nigeria

SAFETY

The roborabbit disappeared before Nika's feet touched the ground. The girl stumbled and stumbled to the floor. She frowningly looked around. The room was tiny, with a flickering emergency light: no windows, no doors, only dozens of cells and lockers on three of the walls. Nika got up, and came up to the fourth empty wall, hardly distinguishing an almost imperceptible gap: a wide, tightly fitted door with no handle.

Nika ran her hand over a smooth metal surface, tried to poke her fingers, and put her ear to the door. She could hear nothing. And how can one get out of this place?

No sooner had the girl really got scared when a clang rang and invisible mechanisms began to move. The heavy door slowly opened, and an enthusiastic female voice came from behind it:

"… the perfect solution for those who prefer to keep valuables at home. The storage is compact and completely inaccessible …"

In that space appeared a woman in a light suit and a muscular man in a T-shirt and jeans.

"Hello," Nika smiled at them.

"Inaccessible?!" the man looked at his companion.

"I do not … You should have met Ersteds!" The woman whispered, blinking aggressively.

"Oh, really," Nika said as if nothing had happened and slipped by them like a mouse.

"In Mikhail's office!" the woman shouted behind her back.

Nika stepped out into the wide corridor. Its walls were covered with touch panels, on which strange devices, similar to a superhero's weapons, were spinning. The girl stopped, fascinated by the graceful bracers on the digital woman's hand. She touched them, and electrodes were fired from the bracers. A man in the corner of the screen cried out and collapsed.

From the shock, Nika jerked back and bumped her back on a very real guy with brown hair.

"Oh, you…!" the man barely kept a full cup of water from falling. "Nika! Where have you been?"

"I … Uh …"

"You haven't replaced the water tank in the office. Now, I have to run to the reception myself?

"Um … Excuse me?"

The guy with brown hair sighed and nodded at the door with the words "Sergey Petrov, digital security consultant."

"Come on."

The room was furnished in a minimalist but cosy way. From milky-white walls, photos of Sakuras hanging on the walls, and a bonsai was curving on the table.

"I apologize for the delay," Sergey smiled at the visitors, a couple of about forty years old. Both fair-haired and blue-eyed, still, they did not look related at all. The man nodded, not looking up from his phone, the woman nervously looked at Nika and grabbed her round pregnant belly, as if protecting her baby. The girl smiled at her but did not receive a smile in return.

"Here you have…" Sergey handed the woman a glass of water, and she answered something incomprehensible.

"Sorry?" asked Nika, but then she saw all three of them with tiny headphones in their ears. Confirming her guess, the guy with brown hair handed the girl two "droplets."

The fair-haired man finally pulled away from the phone and spoke in the same obscure, sticky language, but as soon as Nika put on the headphones, the translation sounded in her ears.

"Ulrike insisted that we met in person," said a pleasant, slightly mechanical male voice. "Her grandmother fled from Russia in the nineties, and it seems to Ulrike that you still have devastation and mafia here."

"I just want to be calm," Ulrike frowned. The translation sounded almost at the same time as she spoke, and it might as well have been what she was saying. "Especially when Torben's rivals almost directly threatened us!"

"Yeah," Torben grinned. "The guys from Aarhus will lose a lot if the deal goes through.

Sergey clicked the mouse and stared at the computer monitor.

"So … You have already done vaccinations and basic tests in Denmark. But it would be better if we repeated the security analysis here. Do you want to add a personal safety designer consultation?"

"What for? I have a minimum number of meetings. My driver takes me everywhere."

"As you say," Sergey nodded and knocked on the keyboard. "We ran data about you online to identify vulnerabilities."

"What are the vulnerabilities?" Nika got interested. "Like, aren't them like… stupid photos or a card number?"

Sergey smiled.

"That is the most basic level, and, fortunately, Torben does not allow such leaks. But the main danger now is not people, but programs. And they can already understand a lot about you with a few likes such as your degree of extraversion, your level of anxiety, your personal addictions … All this information can be used in business negotiations." Sergey paused and leaned over the monitor. "Torben, you are very conscious when leading social networks. But there is still something. First: photos and posts about skydiving, rafting and paragliding together with aggressive discussions in the comments show that it's easy to provoke you, to challenge you. I understand that it can be unpleasant to hear, but …"

Torben raised his hand and smiled. "I know, I know, they told me last year. I have this kind of temper, but now I take care of this." The man squeezed his wife's hand. "I have help here."

"Fine, then the second vulnerability," Sergey continued, and suddenly hesitated. "That's just … Ulrike."

"What?" The visitors asked at the same time. Torben smiled again, this time bewildered.

"Yes, I hardly mention her. The problem is not in your posts."

Ulrike snorted.

"Do you think I'm some kind of Instagram dummy?" Together, we took information security courses, and since then, I have been filtering what I post.

"Unfortunately, people often think so. Yes, you did not post anything obvious, but in the aggregate … See. You complained that you would have to get up at four on Tuesday to catch a flight to Moscow. Only one flight is suitable for these criteria.

"On the selfie in the reflection of the glasses, the monitor screen is visible. On it, you can identify the partial address of the apartment. At the same time, you say that the windows overlook the river, which greatly narrows the search." He looked at the hushed clients. "This, added to the fact that the number of mutual likes in your profiles indicates Torben's great love greatly increases the level of threat."

"Are you talking about Aarhus?" The visitor asked grimly.

"They do not disdain, let's say, the controversial methods of influence."

Ulrike screamed, clutching her stomach with her hands.

"I told you!" She whispered. "I told you, Torben, that it was unsafe here."

Sergey spoke, "I suggest that you consider the services of a personal security designer," Torben just nodded, squeezing his wife's hand tight.

A short woman about fifty years old appeared after a couple of minutes. She sat opposite the couple, next to Sergey.

"Judging by what I see, you did the right thing when you turned to us. What level of security are you interested in?"

"Maximum," Torben answered quickly.

"We track the probabilities of the most common dangers," the designer began. "Theft, robbery, traffic accident, abduction, murder …

"Murder?" Ulrike cringed. "Grandma was right! Nothing has changed here since the nineties!"

"Calm down," Torben squeezed her hand. "Yes, I came here a hundred times, everything is in order! It's safe here."

"Yes, you just wanted a thrill! You have zero regrets and now you are ready to take a chance with our daughter!

"You should not worry like that," the designer smiled softly. "Of all the crimes, murder and attempted murders account for only 0.2%. Despite the fact that the probability of becoming a victim even of a petty crime is less than 1%, our precautions will reduce the percentage to almost zero." She turned to the computer. "As I see it, your apartment has been compromised. In addition, it is not safe enough. There are several vulnerabilities in this type of house: key entry, a hacked digital lock, and, of course, the human factor.

"Over the past year, 7 cases of penetration were recorded. In percentage terms, a little, but we do not want to take risks?"

Ulrike nodded.

"And what do you suggest?"

The designer clicked the mouse, and a colored map appeared on the screen above them.

"Pay attention to the green areas," said the designer. "They are marked as the safest areas with smart homes in which you can rent an apartment. The numbers indicate the degree of security."

"We should be closer to the centre," Torben began. Ulrike shot him a warning glance, then he dutifully added: "But, of course, it's better with maximum security."

"Fine, I'm reserving you an apartment," said the designer.

"Wait a minute," Ulrike intervened. "Is everything automated there? But what if the appliances stop working? Or what if we want something? There is no concierge there!

"In this case, a remote security coordinator is attached to each house."

"Who is this?" Nika got interested.

"It's like …" the designer thought for a moment. "Like a very smart remote guard who is always in touch." She tapped her keyboard.

A good-natured young woman appeared on the screen behind her.

"Good afternoon, Polina. Our clients have several questions about your work, "said the designer.

"Of course. No problem," the woman smiled.

"I perfectly understand your experiences. But I'll say right away that you won't be left alone with robots. I'm always in touch and immediately connect if something goes wrong.

"But while you're somewhere out there, who will ensure our safety?" Ulrike frowned.

"Our systems will. On the front doors are electronic fingerprint locks. Each apartment has smoke and gas sensors. The presence simulation program will not let anybody know that you are not at home. And if something suddenly goes wrong, I will immediately receive a signal."

Ulrike nodded thoughtfully, but as soon as they said goodbye to the coordinator, the woman pursed her lips.

"With the house, I get it. But do I have to be there all the time? All this robbery and kidnapping…"

"Of course not," said the designer. "Our ergonomist designer has developed wearable devices that will keep you safe outside your home. First, here." She placed an obsidian-black ring on the table. "Click on it to call the internal security team. And in addition to it this," a neat little bracelet appeared on the table. "Invisible but a powerful stun gun."

"You spoke about some other dangers in the city—"

"Right. We also assess safety in the immediate vicinity. Overall, your area is one of the safest. But you should pay attention to the nearest intersection. According to statistics, there are 7% more accidents there than the city average. We recommend walking in the park opposite the house. It is the second most secure park in the entire city. The one to the left of your house, unfortunately, is only seventeenth." She smiled at the clients. "All information was sent to you by email. Do you have any questions?"

"I think I do not," mused Ulrike and for the first time at the meeting curled her lips in a slight smile. "Hopefully, the baby and I will survive this trip."

She got up heavily, wrapped her arms around her belly.

"Wait!" Nika intervened when they had already said goodbye. "And what if you suddenly go into labor?"

Ulrike let-off a frightened sound and had already opened her mouth to say something, but the designer was ahead of her:

"Especially for you, we have added to the document the best maternity hospitals. You can use their applications and call specialists at any time."

"Okay," Ulrike said reluctantly. "Probably, the situation has improved since the nineties."

"Hmm," Nika drawled. — There are also mad dogs …

"Goodbye!" said the designer loudly. "Please, complete information in your file."

She turned to Sergei, who was sitting unbothered.

"Listen, would you like to lend me your assistant?" She nodded at Nika. "Such a talent for predicting disasters!"

Nika smiled, flattered, but shook her head: a restless roborabbit peered around the corner in the corridor.

TASK

Create your story based on the following case study and the list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the place where the heroes work be like?

- What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. It turned out that the interactive series about artificial intelligence provokes anxiety and aggression in children in relation to robots. Security professionals, along with media and entertainment professionals, must work together to solve this problem.

VISION OF THE FUTURE

Human life is becoming more comfortable and longer, but there are also new threats, including man-made and environmental disasters, new types of weapons, and cyber-attacks. Therefore, in some respects, security issues are becoming even more relevant.

The development of IT technologies will lead to the expansion of protection and self-defense capabilities and, accordingly, to a change in security standards, both in the virtual world and in reality. We will less delegate the security functions to people and increasingly rely on smart systems of control, analytics, and automatic control.

At the same time, the development of artificial intelligence and the widespread use of automated control systems can lead to the fact that smart systems will become too complex for human understanding, or users will become too dependent on them. And this creates serious threats if the program crashes or decides to act independently. Therefore, in the future, the development of security systems involves the development of protection against the incorrect operation of artificial intelligence and alternative rescue plans in case computers cannot be used.

Security systems will increasingly be aimed at preventing dangerous situations, for example, through the analysis of street video surveillance materials for illegal activities or patrolling streets with drones or robots. The HP Robo-Cop police robot has already appeared in the United States, which fixes offenses and writes out fines (although he cannot detain criminals yet). And the Moscow police department is going to acquire 20 drones for patrolling roads.

In addition to real technological advances, there is also an element of cunning — people, in general, are less likely to break the law when they know that they are being watched. Augmented reality goggles will help police identify people and vehicles and, if necessary, connect remote consultants to help. The Dutch police are already using AR glasses, which can give tips on collecting evidence and save video notes for forensic experts.

Industrial safety is associated, on the one hand, with the correct operation of automated systems, and on the other, with digital modeling of possible analogous failures (for example, in the supply chain) and the inclusion of spare solutions in calculations and plans. In calculations, risk managers will increasingly be helped by programs that simulate different types of system failures.

In digital security, quantum encryption technologies are emerging where data is encoded in the amplitude of the electromagnetic field or polarization of photons. The main advantage of quantum encryption is one hundred percent protection against secret wiretapping.

According to the laws of quantum mechanics, an attempt to access information will make changes to the transmitted data, and the recipient will find it out. Moreover, using a quantum computer, it will be possible to crack even very complex mathematical ciphers, which jeopardizes data privacy, and these risks will have to be foreseen.

New security systems will require new legislative regulation and the development of professional standards and technical regulations. There will be more independent companies with a large number of trained specialists in the field of risk management. There will be a demand for services for the assessment and design of personal security in different conditions. For example, a person will be able to consult a security specialist before traveling to the jungle or a metropolis with a high crime rate.

In a complicated and unstable world, various devices that ensure the personal safety of citizens will become popular. For example, now there are bicycle helmets with sensors that respond to accidents and send a signal to the ambulance service, jackets with built-in radios and GPS navigators for climbers, and gas mini cartridges for the iPhone.

Technical tools will also be developed to expand the professional capabilities of security personnel, such as sandals with retractable flippers for lifeguards working on beaches, or an exoskeleton for firefighters.

In addition, robots will also come to the rescue of people. For example, the Seascout water model can find a drowning person using GPS signals (though it still cannot pump out those who have already lost consciousness). New sensors will help to avoid poisoning — for example, there is an Undercover Colors nail polish that partially protects against sexual violence: if a woman doubts whether she has a drug in her glass, she can dip her finger in it and in case of danger the varnish will change in color.

A separate issue of private security is the protection of smart homes. They have several risks at once: the leak of personal data, malfunctioning of household appliances, penetration of strangers. So far, there are a lot of vulnerabilities in smart home security protocols. For instance, in a backup copy of the cloud server from which the owner remotely controls the home, there may be unencrypted personal data. Or, for example, in the presence of certain bugs, you can gain control over cameras and alarms through other devices.

As a complex system, a smart home requires a more integrated approach to IT security. In addition, the services of remote coordinators of security systems that can secure the owner in case of any malfunctions will be in demand.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

ERGONOMIC DESIGNER OF WEARABLE SECURITY DEVICES

A specialist who develops gadgets to provide enhanced user safety in an emergency. This profession requires a harmonious combination of common sense and imagination because you can solve the problems of self-defense in different ways. For example, Armstar developed the BodyGuard protective sleeve, equipped with a camera, alarm device, and stun gun.

CROSS-PROFESSIONAL SKILLS
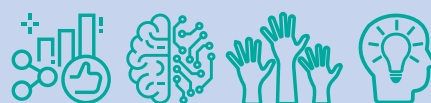
PERSONAL SECURITY DESIGNER

A specialist who evaluates and projects a person's life from the point of view of all possible risks (from a genetic predisposition to certain diseases to the likelihood of accidents and the fact that a person will become a victim of a crime) and their prevention. He or she can be either a permanent consultant or provide one-time services. For example, if the client has a business trip to a dangerous region.

CROSS-PROFESSIONAL SKILLS

REMOTE SECURITY COORDINATOR

An operator of new automated and robotic security systems, monitoring their status through sensors and surveillance cameras and, if necessary, sending a quick response group to the object. This is a development of the security profession and will be replaced in the future by fully automated security systems.

CROSS-PROFESSIONAL SKILLS
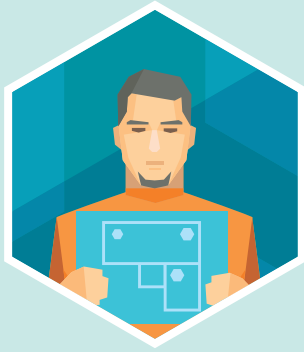
INTEGRATED SECURITY AUDITOR IN INDUSTRY

A specialist who assesses the security status at an existing facility, and he considers all types of threats: mechanical damage, fires, environmental threats, cyber-attacks, etc.

CROSS-PROFESSIONAL SKILLS

PERSONAL PROFILE SECURITY ADVISOR

An information security specialist for network users. By order of the client, he forms for him the current information image of the client on the network from all information available about him. He conducts an audit of the client's work on the network to identify vulnerabilities, ensure confidentiality, and overall security. At the client's request, he eliminates vulnerabilities, edits user information on the network until it is deleted, and forms the client's image. Advertising is already able to accurately influence a person with the help of the data collected, behavior assessment on the Internet, photos, and posts on social networks. In the future, the pressure will only increase.

CROSS-PROFESSIONAL SKILLS
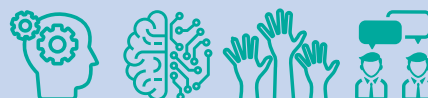
CHILD PSYCHOLOGICAL SAFETY SPECIALIST

A professional testing various children's goods and services (toys, games, cartoons, clothes, furniture, etc.) for threats to the psyche and potential harm to the development of the child. Based on the results of tests, he makes recommendations for finalizing the product and how to use it.

CROSS-PROFESSIONAL SKILLS

BUSINESS CONTINUITY MANAGER

A specialist who ensures the uninterrupted business processes in case of problems or disabling the enterprise's IT systems due to cyber-attacks, software errors, technological disasters affecting the operation of the network, and other force majeure situations.

CROSS-PROFESSIONAL SKILLS

IT SECTOR

The first thing Nika felt was silence. Heavy, absolute silence. The girl opened her eyes and cringed. She was in a room without windows and doors. The walls were upholstered with metal, and the only furniture there was a white metal table and simple chairs. In TV shows, investigators usually sit at such tables during interrogations of villains. Have I got to jail? To the police? Nika thought, scared.

Her thoughts were interrupted by metal scraping. An invisible panel moved out of the wall and drove off to the side.

A stooped guy in a white T-shirt reluctantly entered the room. Nika involuntarily frowned: the guy was sweating profusely, dark spots appeared under his armpits. The stranger hobbled to the middle of the room and hesitantly stopped by the table, not knowing whether to sit down or remain standing.

Nika noticed that his shirt had big letters, CSI. The man who came in after was completely different. A loose hoodie, a bully curly beard, a metal earring in the ear—in the days of Nika, programmers and art cafe baristas were dressed like that. This man noticed her, came up and, smiling, extended a hand.

"Hello, intern! I'm Sergey Ten, a junior cyber investigator."

"Cyber… who?"

"Cyber investigator. I investigate virtual crimes. Can you help?"

"Um… of course," Nika said and thought to herself that Ten was not like a detective at all, he was some kind of very… sloppy or something.

The cyber-investigator sprawled in a chair opposite the guy in the T-shirt and nodded to him: "Sit down."

The guy plopped down on a chair. The investigator took a tablet from his pocket. He ordered: "Start recording," and continued in a stern voice, "First and last name."

"Valery Doronin," the T-shirt guy said.

"Position in the company?"

"Equipment failure analyst."

"Experience?"

"One month."

The investigator glanced at the tablet. Nika saw how the guy's data appeared in the document.

"Well, Valera." Ten leaned back in his chair. He threw his hand over the armrest, making his whole pose even more impertinent. "Somehow, the flash drive with the new program turned out to be a surprise. With a trojan, that is. Yes, such that the antivirus missed it. Tell me as a forecaster, what does it threaten?"

The guy nervously glanced at the investigator, then at Nika and swallowed.

"Details or briefly?"

"In detail, of course," the investigator grunted. "Let the intern learn."

"Trojans are malware," the forecaster began, trying to look only at the girl. "You know, like computer viruses or worms. Only trojans disguise themselves as useful programs and cannot spread spontaneously, like viruses."

"Why are they needed?" asked Nika.

"Most often to steal user data, credit card numbers, passwords. Or get remote access to computers, and then access to confidential information."

"And your trojan?"

The forecaster flinched at the word "your" but replied:

"I didn't figure out much. You pulled me out quickly. But, as I understood, it got access to information on the pace and volume of production, on the functions of each employee, even on how much everyone is paid."

"So, espionage?"

"Not only. Theoretically, it can change data in files, disable computers. Therefore, our people are hastily removing it now. I would join them there now," the forecaster stammered.

"Well, well," Ten shook his head. He removed his hand from the armrest, interlocked his fingers on the table, looking directly at the guy. "And you, Valera, guess why you are not with "yours" now, but here, with me? Who is the first to fall under suspicion?

"Sysadmin, probably," the guy muttered. "He inserted a flash drive. Or Ekaterina Evgenievna, but this is absolutely wild … Why her, to jeopardize her company?"

"All right," Ten said and looked carefully at the guy.

The forecaster blinked. Drops of sweat rolled onto his nose, but he did not think to wipe it off.

"Profiler?" he whispered at last.

"Profiler," Ten nodded. "He brought you out as the main hacking suspect."

The silence lasted several seconds and became oppressing. Therefore, Nika asked:

"And who is the profiler?"

The despondent forecaster did not even look up from the table, but Ten turned to the girl.

"Not 'who,' but 'what.' A profiler is a computer neural network that can analyze information and draw its own conclusions.

"It means the computer itself can think, can't it?"

"If you train it properly." Ten nodded. "It is instrumental when you need, for example, to identify the culprit. The machine notices so many details, compares as many input parts as a whole squad of detectives could not. Or could, but it would take a lot of time. People do not think as fast as neural networks."

"But then, the network was wrong!" the forecaster voiced. "This … this cannot be me."

"Why?" Ten smiled predatorily.

The guy's eyes were darting back and forth. He muttered under his breath:

"The trojan was discovered fifty minutes ago. So, it was the morning update. Before that, everything worked fine. Ekaterina Evgenievna brought the flash drive at half-past twelve. Kolya probably went to lunch first, and only then loaded it… Is that right?"

"How well you know everyone."

"So, the flash drive could be replaced only from half-past one to three o'clock!" the forecaster triumphantly concluded.

"From half-past one to one in the afternoon," Ten corrected. "Your system administrator did not have lunch for so long. Just what does it change?"

"But look!" Valera pulled a smartphone out of his pocket, feverishly flipped through several tabs.

"Here!" He shouted, poking Ten in the face with his device.

"This is the bill for lunch," the investigator calmly remarked.

"Look at the time! From twelve to one o'clock, I had lunch, and then I was even in another building!"

"Maybe it was not a flash drive at all, and the trojan was downloaded remotely."

"They couldn't," the forecaster almost smiled. "That part does not have access to the Internet."

Ten scratched his beard thoughtfully. Then, he turned on some kind of video in his device. Peering over his shoulder, Nika saw that this was a recording from surveillance cameras in a large cafe. Ten enlarged the image, and the figure of the forecaster actually appeared on the screen: he walked to an empty table with a tray.

"You see?" triumphantly declared Valery. "And the time coincides!"

"Invite a dataset specialist here," Ten said into the tiny earphone in his ear.

"Why don't you look at cameras from the system administrator's office?" asked Nika, looking at how the forecaster ran out of the interrogation room. "Or next to it. Who is on camera, that is our pest?"

"Why would we sit here if everything was so simple?" Ten chuckled. "There is no recording from there. The attacker was not a fool and wiped it out. He just forgot to delete the recording from the cafe …"

"Good afternoon." The investigator stretched out, welcoming the swarthy woman who entered.

She nodded, calmly sat across from the investigator with Nika, and crossed her legs.

"Are you about the trojan?" She asked. Ten ignored her question.

"Did you train the profiler?"

"That's right." The specialist nodded.

"But you are not a staff member, are you?"

"But in our business, no one works permanently." She shrugged. "We accept requests. In this case, the order was for a selection of datasets for the security program, a universal protection against spies and saboteurs."

"And what is a dataset?" asked Nika.

The dataset specialist pulled out a tablet.

"May I?" She asked Ten. He nodded. The woman turned on the device and set it to Nika.

"A dataset is a set of data that is needed to train a machine. In our case, these are videos that we upload to the profiler." Several video tabs were opened on the screen: recordings from surveillance cameras to watch from several office lounges.

"What is this logo?" Nika pointed to the corner of the screen.

"Archived tag." The dataset specialist enlarged different records.

"On each of these videos, there is a man who was later caught on industrial espionage or sabotage. We mark these people for the machine.

The network remembers how an attacker behaves. It learns to recognize common patterns in a hundred, thousand, five thousand examples."

The videos had changed. It was still smoking rooms and lounges, but already different, with new people.

"There are no criminals in these videos, all honest people," the data specialist

continued. "So, when the profiler has ten thousand videos with criminals and ten thousand without criminals, it can find some differences."

"Like a child with pictures? 'Find ten differences?'" For some reason, the thought of infant artificial intelligence made Nika laugh.

"Exactly. But the profiler defines not ten, but ten by ten differences. The manner of moving, the speed of conversation, changes in complexion. Even time to leave work: criminals often remain after closing. Theoretically, the profiler can recognize a criminal before he commits a crime."

"This time," however, "it did not recognize," Ten remarked.

Nika drew attention to the fact that before this, the cyber investigator did not particularly listen to the dataset specialist.

"The main suspect has a flimsy alibi, but he has it.

"Even if you say that it's flimsy," the woman was not at all embarrassed, "I am responsible for our network."

"Well, then," Ten stood up and shook her swarthy hand, "thanks for the help," and immediately switched to the earphone. "Call the dataset verifier."

A large fair-haired man changed the swarthy woman. Unlike his colleague, he looked worried.

"Thousands of video files have been uploaded to your network," Ten began right away. Nika saw that failure with the forecaster provoked him. "How can you be sure that the network will not receive misleading information? Or it doesn't interpret something wrong?"

"That's what I'm needed for," the verifier smiled nervously. "I check the accuracy and representativeness of the data.

He turned his phone to the investigator and Nika. Graphs and charts bloomed on the screen with multicolored lines and columns.

"Here is the number of those videos that were uploaded to the profiler initially. But already with that, we started training."

Nika could not resist and whistled. The final sample, compared to the initial general data, was just tiny. Of the huge amount of material, probably hundreds of hours of uniform video recording, they took only a couple of percent.

"Why are you throwing so much away?" she asked.

"Depends. Blurry image, non-representative cases. Only those videos are needed, which can let the network make a clear algorithm."

Nika noted with displeasure that Ten again did not listen to the expert's explanation. He buried his nose in the gadget and only clicked on the keys. It was as if it wasn't up to him to solve this case.

"Thank you. I've understood you," Ten said, not looking up from the smartphone. "You are free to go."

The verifier nodded and stood up. Hastily, he left.

"Why don't you ask them well?" Nika attacked the investigator. "Who is the criminal? We have not found out! Not a single version!"

"Actually, there are already three of them." Ten chuckled, looking with pleasure at the girl's stunned face…

"So, gentlemen," the investigator began. All three specialists were at the table in front of him. "Before the investigation moves anywhere, I need to ask you some general questions."

It seems like Ten deliberately paused to make the situation in the room even more intense.

"Firstly," Ten suddenly pointed at the swarthy specialist, "is it true that you have taken orders exclusively from RosMatrix for the past six months?"

"What? Does it make any difference?" the dark-skinned woman snorted angrily but did not have time to finish.

"Here." Ten showed everyone the screen of his mobile. "We see the data of your digital labor book. You were engaged in installing datasets for RosMatrix networks … however, in your CV," Ten displayed one more document, "you avoided to mention it. This, in general, is understandable: RosMatrix employees have a bad reputation, and it is difficult for them to find work. There are rumors that no one actually quits RosMatrix. So-called laid-off workers are actually sent to spy on competitors."

"I'm aware of gossip, thank you," the swarthy woman said. "But this is idle talk and has nothing to do with the case."

"Of course, it doesn't," Ten confirmed with some manic friendliness. "Like the fact that two people in this room loved the same girl."

"What?" could not resist Nika.

On the screen of Ten's device flickered photos. Chubby verifier and a pretty girl on the sea background; on a mountain road; walking in the park.

"We broke up in a good way," the verifier flushed. "Like civilized people."

"Of course. But in a month …"

The girl in the new photos was still the same, but the man changed. Now, the forecaster smiled from the screen: in the ice cream store, on the Ferris wheel, in the cinema — everywhere. Valery's photos were changing, each faster and faster.

"It's surprising what a drama is hiding on a regular social media feed," Ten said, putting away the phone.

Verifier's lips quivered; he glanced at the forecaster and abruptly turned away. It seemed like the forecaster wanted to say something, but only wiped his sweat off his forehead. The dataset specialist glanced from one man to another, trying to look everywhere but not at the investigator.

"So, what do we have?" Ten pulled away from the table and jumped vigorously on his feet. "A new employee is hired at the company, and a new profiler is installed. After a month, the company is hacked, the profiler points to a new employee.

I see three scenarios for the course of events: either the employee," he pointed to Valery, "made up himself an alibi or acted with an accomplice; or an agent of competitors," Ten's finger pointed to the swarthy woman, "initially selected datasets in a way to frame an innocent one; or," Ten looked straight at the face of the verifier, "the offended man corrected the datasets so that his offender got hit."

"Ridiculous," the dataset specialist snorted.

"This is absurd," the verifier muttered.

"That's all strange," mumbled Valery.

"These are the facts. I'm sure your superiors will be curious to know these details."

Then, a deafening noise filled the room as all three of the interrogated persons spoke at the same time, trying to yell over each other.

Nika's voice was not heard clearly in this noise:

"Does the profiler analyze only people or all the videos?"

Of all those people, only Ten could hear her. He abruptly turned to the girl:

"What?"

"Well … we proceeded from the fact that the network analyzes only people and their behavior. But all the entire videos were loaded into it … and all the videos are there to be analyzed. There was a logo on the video with the criminals … the same as on you." Nika nodded to Valery.

Now, everyone was silent. Ten shouted into the microphone:

"The neural network controller in here!"

Everyone was crowding around a calm older woman with neatly styled hair.

"Let's see…" she muttered. She brought out on the tablet screen the videos from which the profiler was trained. "Now, I will start the diagnostics, and we will find out which fragments of the video the network used in the first place."

An indicator on the screen showed that the video was being processed. Particular pieces of the image blinked with bright lights.

"Here you are," said the controller. "The system highlights the pixels on those fragments that the profiler considered especially important."

"And?" Ten looked over her shoulder.

Nika also glanced at the screen. In all the videos where the attackers were captured, a small logo burned brightly in the corner of the screen: CSI.

"Crime Scenery Investigation," the woman said. "Well, it's logical: the records are taken from the archives of the forensics, and they mark their videos like that."

Everyone turned to Valery, and at the same time, without saying a word, looked at his white T-shirt. T-shirt with capital letters CSI.

"Crime Scene Investigation," the forecaster confusedly explained. "This is an old series. I love it very much."

In the sudden silence, the dataset specialist choked a giggle. The verifier chuckled. Ten threw back his head and laughed out loud.

"But the case has not been solved," said Nika, when she and Ten were alone in the room. The interrogation was completed; the witnesses went back to the workplaces. "We did not find out who downloaded the flash drive."

"We didn't find out," Ten agreed, filling out the protocol in an electronic notebook, "but we found out that no one had framed Valery. In a way, this is more important."

"Why?"

"It's like doctors say: first of all, do no harm. If the network is adjusted, there is less chance that we will once again suspect the wrong person or ruin someone's life. To justify the innocent is more important than to find the offender," finished Ten, putting the final point and turning off the device.

"So, analysis cannot be given to a computer? A man would not make such a mistake."

"A man would not. But a person has experience and context. And the computer has only the information that was downloaded to it. So, it interprets it as it can."

"And what does that mean?"

"That means," Ten stood up and moved toward the door, "that computers will help where there aren't enough people or human organs of perception." At the door, he turned to Nika. "An attentive person is still irreplaceable." He winked.

The moment the door closed with a clang; the robotic rabbit materialized next to Nika.

"An attentive person is irreplaceable, got it?" Nika asked the roborabbit.

TASK

Make up similar stories based on the following cases and the list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

● How many different specialists do you need to complete a task?

● What the room might be like where the heroes work?

● What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case 1. You need to develop and install augmented reality interfaces for an exhibition in the space museum.

Case 2. You are asked to develop a virtual office for a distributed team (a team consisting of people who are physically located in different places) of scriptwriters: VR helmets, an interface, a virtual space design that would inspire creativity.

VISION OF THE FUTURE

With the advent of computers, we began to replace human labor with them wherever something could be algorithmized. The collective experience started to transform to use as software instructions. That way, many routine tasks can be replaced by software algorithms. One of the first famous cases of massive automation was the emergence of applications such as Uber and Yandex.Taxi, with which the dispatchers of taxi fleets became unnecessary.

At the same time, the travel agencies began to lose their market shares — under the onslaught of booking services such as Booking.com, Airbnb, and dozens of flight aggregators. However, at some point, this process hit the limit of the possible for classical algorithms. The operation of computers according to the instructions "if the condition is A, then the consequence is B" does not allow solving complex problems in which the number of possible options increases exponentially (for example, playing Go or analyzing images from cameras for threats).

The situation was changed by the methods of machine learning, in particular, neural networks programs built on the same principle by which neural networks work in our brain. In the late 1950s, the perceptron, a computer model of a neuron, was invented. Neural networks and other machine learning methods began to appear. However, they were developing mainly in science and were not applied in practice, because for decades, computers did not have sufficient computing power.

A breakthrough occurred in the early 2010s — the evolution of processors and graphic computers, which allowed the use of machine learning much more widely. One of the first steps to using neural networks in practice was Andrew Ng's Machine Learning course in 2011.

Machine learning automated part of the functionality that people used to be responsible for, but new tasks appeared. First of all, to prepare and verify data for the training of artificial intelligence. In addition, programmers had to teach computers how to "translate" the logic of neural networks for human comprehension. Otherwise, it was impossible to assess whether the neural network "thinks" correctly. A neural network makes decisions differently from a human and can take into account some insignificant details that can distort the perception.

The next development level of information technology is quantum computers. They use the unusual properties of quantum particles to increase the speed of solving some mathematical problems. For example, a primitive quantum computer developed by Google solved the problem 100 million times faster than a regular computer.

The creation of such computers is challenging. Due to the influence of the environment, quantum states can be destroyed, and errors arise in the calculation process. Therefore, nowadays, it is possible to create only the simplest versions that can solve only a few tasks. In Russia, quantum computers are being developed by the Russian Quantum Center, the Institute of Solid State Physics of the Russian Academy of Sciences, MISiS, Dukhov Automatics Research Institute (VNIIA) and Bauman Moscow State Technical University, the Center for Quantum Technologies of the Physics Department of Moscow State University.

The world in 15 years is a world in which programming is a new literacy. Everything works using software — from agriculture to science, from tourism to beauty blogging. The software adjusts almost free, so there are not many suppliers and people who provide advanced development. The rest introduce, configure, and support new programs. There are many software support specialists in all sectors; most often, they will work on outsourcing.

Distributed ledger technologies (the most famous example is blockchain) allow decentralized data storage and changes only with the approval of all participants. Initially, these technologies were used in the financial sector, but now they are used in various fields. Distributed ledger technologies make interactions between individuals, banks, lawyers, enterprises, and government agencies more transparent and reliable. The Estonian government uses them for a digital public services platform. Similar technologies are being tested by the UAE and China.

The downside of blockchain technology is that recordings are made using complicated energy-intensive computing. The longer the system exists, the more expensive each record is, as calculations become more complex and take longer. And they also spend electricity, which means they damage the environment. Nowadays, the servers that serve the bitcoin market consume about the same amount of energy as the whole of Ireland. Therefore, in the future, the technology most likely will be either simplified or replaced with another one.

Demand for AR/VR professionals is growing, not only in the entertainment industry but also in companies and industries. At enterprises, manuals appear in the AR format, allowing workers to cope with tasks more quickly and accurately. In the future, specialists will be able to control robotic avatars using a helmet and a virtual reality suit, like in the movie "Pacific Rim." The process slows down the quality of the hardware. The resolution of the screens is too low, and the picture is transmitted with a delay, which causes problems with the vestibular system, as suits poorly convey tactile sensations, etc.

The boundaries between virtuality and the physical world are blurring, which means that society in the digital space will be organized according to the same principles as in reality, including state borders and control by governments. For example, legislation governing cyberspace will appear everywhere.

Moreover, the "digital gap" between people will create a new kind of social stratification. Those who have higher computer literacy will have more opportunities. To eliminate the stratification, special ICT education programs will appear.

With an increase in the amount of information, the need for new security systems, filtering methods, and protecting data will increase. Moreover, because of the spreading of large-scale cloud storage systems, data leakage can have dangerous consequences for a much larger number of people.

In the next ten years, technologies for the accurate recognition of Internet users online will appear. Technologies from spy and science fiction movies will become a reality — the user of the device can be identified not only by fingerprints or by scanning the retina, but also by DNA analysis. There are already programs that can identify the user by the speed of typing on the keyboard. On the one hand, such technologies help to identify offenders more effectively, but on the other hand, they interfere in people's private lives and, in unscrupulous hands, can turn into a totalitarian system.

Therefore, engineers and scientists are looking for a balance between the expected benefit and privacy of users. Such a compromise may be, for example, federated machine learning, in which the data center does not have direct access to the source data for training models, which allows them to maintain confidentiality.

Technologies will also be developed that will verify the authenticity of information and verify its sources. There will be insurance institutions protecting against risks associated with the virtual environment, and consulting agencies for user safety on the network and his image there.

In addition, there will appear more and more smart appliances and machines that can be managed from a distance. This makes life more comfortable, but at the same time, it means that physical objects can also be attacked from virtuality. For example, turn off the electricity in the house.

Process automation leads to an increase in the number of sensors connected to data processing networks and allowing to monitor the state of the observed systems. And this, in turn, makes the infrastructure more vulnerable. Accordingly, it is necessary to develop reliable methods for protecting smart networks and the Internet of things and come up with alternative ways to manage them in a crisis situation.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

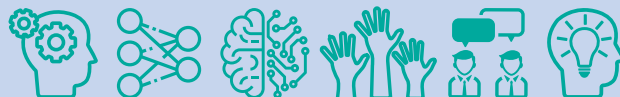Ecological thinking

Working in uncertainty

IT

DIGITAL OFFICE ARCHITECT

A professional who designs digital offices (from cloud-based management programs, such as BaseCamp, to virtual spaces) for the specific tasks of work teams. He or she manages the user's request, finds the best solution, thinks through the design, creates software.

CROSS-PROFESSIONAL SKILLS

DATASET COLLECTOR

A specialist who prepares data for artificial intelligence training (for example, pictures by which the program learns to recognize faces). Machine learning requires a lot of good quality data, which is nowadays often prepared by people. The problem is that even for relatively simple tasks, a machine needs to learn from tens of thousands of examples. And if some mistakes were made when collecting the examples, then the AI trained on them will solve the problem with distortions.

CROSS-PROFESSIONAL SKILLS

DATA QUALITY VERIFICATION SPECIALIST

A professional who checks the quality of the data on the based on which Big Data models and machine learning will be built. Nowadays, errors are accumulating because the source data has poor quality, and this confuses artificial intelligence. To improve the quality of sampling, there should be an automated data validation. The program should at least indicate to the person suspicious data in the dataset, and possibly clean it up by itself. Most likely, in the next 15 years, algorithms will learn to sort raw data into categories like "definitely bad," "questionable," "good," and will give hints. For example: "30% chance that a kitty is shown in the picture — is this true?" But the final decisions will remain for the people.

CROSS-PROFESSIONAL SKILLS

BIG DATA MODEL DEVELOPER

A specialist who develops models for analyzing big data. This profession already exists, but the demand for it greatly exceeds supply.

CROSS-PROFESSIONAL SKILLS

PRIVACY BALANCER

A specialist who will seek a balance between maintaining the confidentiality and practical benefit for the user from the use of his data. The less user data is available to third parties, the more difficult it is for developers to make a convenient solution that considers the individual characteristics of the client. But the more opportunities for personalization, the less privacy.

CROSS-PROFESSIONAL SKILLS
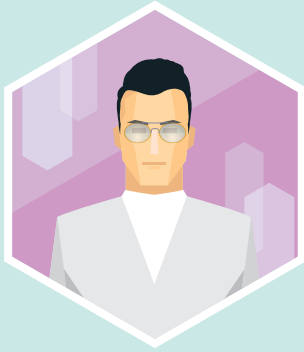
HARDWARE DEVELOPER FOR AR / VR SOLUTIONS

A specialist who creates the hardware for virtual, mixed, and augmented reality devices and makes it comfortable to use: easy, with a clear picture, not confusing the vestibular system, etc.

CROSS-PROFESSIONAL SKILLS

QUANTUM COMPUTER PROGRAMMER

A specialist who creates quantum programming languages, algorithms, and final software. It is not yet clear how exactly quantum computers will work, so this is a profession for the very distant future. Nowadays, experts deal only with particular algorithms and simple tasks.

CROSS-PROFESSIONAL SKILLS

NEURAL NETWORK CONTROLLER

A specialist who marks the attributes by which a neural network makes a conclusion and tries to reproduce its logic. Neural networks are better trained in face recognition and other complex AI operations, but they still often make mistakes or use patterns that are incomprehensible for humans to solve problems.

CROSS-PROFESSIONAL SKILLS
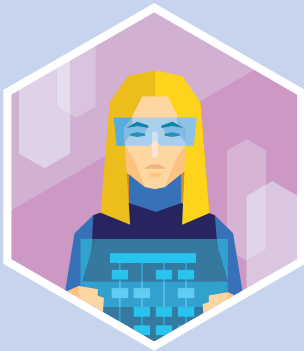
INTERFACE DESIGNER

A specialist who develops and creates user-friendly, adaptable-for-human safe interfaces of equipment, technology, software, at various levels. It is important for him to be able to create interfaces with good usability, that is, as comfortable as possible for the user. The profession already exists and is in demand, but the developing human-to-computer interaction will lead to the need for more of such specialists, and their skills will be modified to solve new problems.

CROSS-PROFESSIONAL SKILLS
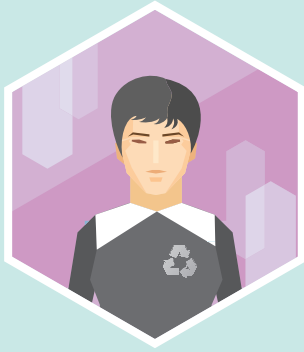
INFORMATION ECOLOGIST

A specialist who develops standards for digital environmental safety analyzes the production, develops guidelines and rules, and monitors their compliance.

CROSS-PROFESSIONAL SKILLS

USER EXPERIENCE DESIGNER (UX)

The objective of this designer is to make the user experience as comfortable as possible. To do this, he teaches programs to respond to the sequence of actions that the user usually performs, both within the same application and different ones. This leads to the fact that the same functions may look different, depending on how the user uses the system. For example, in the latest Android version, the system learns from user behavior and predicts which application he will open next. Therefore, the phone displays in the menu those applications that the user most likely will use. Many other applications will be built on this principle — they will guess the user's desires and prepare for him corresponding icons and buttons.

CROSS-PROFESSIONAL SKILLS

NEURAL INTERFACE PROGRAMMER

The developer of software for neuro feedback devices. For example, to create data analysis programs for scientists or training applications for ordinary consumers.

CROSS-PROFESSIONAL SKILLS

CYBER TECHNICIAN FOR SMART ENVIRONMENTS

A specialist who is engaged in ensuring security in the lower levels of the information infrastructure, combining smart environments (meaning for small local networks). It is assumed that both households and businesses will be separated from the World Wide Web into a separate segment connected to the common network through secure low-level connections.

CROSS-PROFESSIONAL SKILLS

INFORMATION SECURITY CURATOR

This specialist works in automated manufacturing. He provides security, protection, and stable operation of production control systems and information processing operations. Unlike a security specialist for the smart environment, who is responsible for the operation of smart environments for the end-user, this professional is responsible for the operational safety of the industrial Internet of things — smart industries. This profession already exists, but in the future, demand for it will grow.

CROSS-PROFESSIONAL SKILLS

IMMERSIVE DESIGN SPECIALIST

A designer who develops interfaces that combine different technologies, from voice recognition and gesture control to virtual and augmented reality. Immersive design, meaning, blurring the line between the digital and physical worlds, is in demand primarily in the fields of education, culture, urban development, tourism, and entertainment. The British Higher School of Design is already offering a program in this area.

CROSS-PROFESSIONAL SKILLS
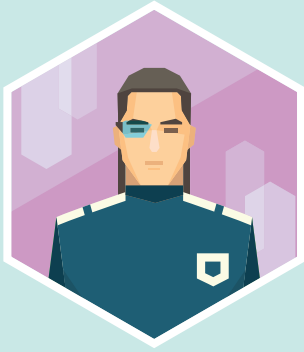
CYBER INVESTIGATOR

A specialist conducting investigations, searching, and processing information on the network. In particular, he or she can actively seek information through officially authorized cyberattacks on suspects. In fact, cyber investigators are already actively working, but the need for specialists of this kind will only increase.

CROSS-PROFESSIONAL SKILLS

DIGITAL LINGUIST

A professional who develops linguistic systems of semantic translation (translation taking into account the context and meaning), text processing systems (including semantic search on the Internet), and new communication interfaces between a human and a computer in natural languages.

CROSS-PROFESSIONAL SKILLS

TECHNOLOGY EVANGELIST

A specialist who interacts with end-users of IT products and promotes new solutions in groups that are conservatively inclined towards advanced technologies. He or she teaches people to use new programs and services to narrow the digital gap among the population. Activities aimed at educating people about digital literacy are taking place now, but usually on a voluntary basis. In the near future, it will become a real profession.

CROSS-PROFESSIONAL SKILLS
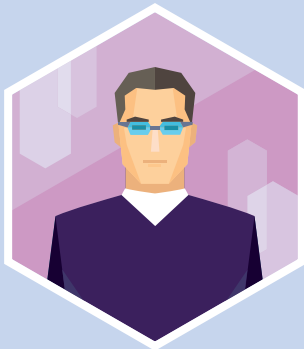
IT AUDITOR

A professional with a specialization in software development. He checks the operation of complex IT systems, errors, or hacking, potentially carrying high risks. In particular, it assesses the software security of these systems and even tracks the process of software development and the qualifications of developers.

CROSS-PROFESSIONAL SKILLS

ONLINE LAWYER

A specialist providing regulatory interaction online (including in virtual worlds). He or she develops systems of the legal protection of people and property on the Internet.

CROSS-PROFESSIONAL SKILLS
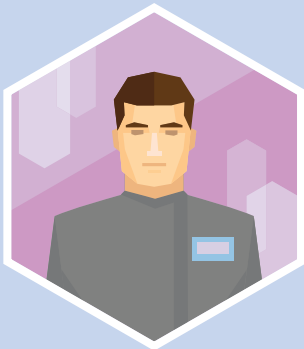
INFORMATION SYSTEMS ARCHITECT

A qualified specialist who works with data processing systems. In particular, he or she designs databases, develops algorithms for their action, provides convenient use of data warehouses, and controls the quality and logic of information storage and retrieval. Such professionals are required nowadays, but in the future, when information technologies will penetrate all spheres of human activity, they will be needed even more.

CROSS-PROFESSIONAL SKILLS

LAND TRANSPORT

As soon as Nika felt the solid ground under her feet, lightning flashed through her closed eyelids. Nika opened her eyes and looked around.

She was in a spacious round room, crowded with many devices and monitors. The walls were made ofglass — or rather, not even walls, but panoramic windows. On a good day, a good view of the landscape was probably opening from here. But now, there was darkness outside the windows, interrupted only by flashes of lightning on the horizon. Slanting rain jets thrashed into the glass. Nika thought that the glass must be very thick: no rumble of thunder could be heard, only the sound of drops.

There were three persons in the room. They were shuttling between devices, taking readings, switching images on screens.

"Hi," said the guy in the plaid shirt to Nika. "Sorry, we have a little rush here."

"Anton, pay attention? please!" a girl with a purple strand in her hair called him out.

"On Zeninsky highway, a horrible traffic jam is expected. I'm opening the fifth lane."

"Okay. And put the traffic light there for a longer time, increase the interval by twenty seconds."

"Done. Damn it! On Kosinskoe highway, there is a self-driving car with a special cargo to deliver."

"What's the cargo exactly?" Anton jumped to the monitor. "Wow! A donor heart."

"Exactly. Now, look." The girl pointed the cursor on a virtual map. The curved snake of the highway was highlighted with red.

"Accident. Overspeeding."

"Whoa," the guy with a metal bracelet on his hand whistled. Silently sitting aside before that, he now rode up in a chair to the screen and looked anxiously at the scale of the disaster.

"Well, Veronica, you are our transport analyst. Analyze. How bad is it?"

"I already called tow trucks, but…" the girl muttered, displaying the results of a digital calculator. "For an hour, the traffic will be down, no less."

"Boris, how much time does the heart have?" asked Anton.

"The donor organ lives for four hours. It's been on the way for two hours already. Plus, time for an operation," Boris thought aloud. "No, this route is not an option. It will turn off the road."

"Turn off?" asked Anton with rising anxiety.

"By the way, yes, there is a side road," said Nika. "The car will have time to turn before it gets stuck in traffic. What is the problem?"

"Look," Boris turned towards her, "this is a self-driving car, an unmanned vehicle. It drives faster and more carefully than if it was controlled by a human. But on a proper road, where there are special sensors, a correct road surface, an arranged transport flow, if the car leaves this road, something may go wrong. That's risky."

"Exactly," Anton added, "and I don't want to think up in a rush later how to get someone's heart out of a car in the middle of a thunderstorm on a wet road. I am a specialist in cross-logistics, not road magic."

"But there aren't any other options," said Veronica. "It's either to bypass or to wait until we remove the traffic jam. In the second option, the heart will definitely be late."

"It's too late to argue," said Boris. "It already chose to turn. Let me connect to it directly; let's see how it handles it."

Boris drove off to another computer. Another map was displayed on the screen, only now a bright dot was rapidly moving on it. Some recordings ran in a column on the side of the screen.

"And what is this?" asked Nika, pointing to a crawling column.

"Information from the car. Speed, estimated time of arrival, the height of the road above sea level, a lot of things," said Boris. "You see, I am usually not needed for the car. It analyzes the situation by itself and adjusts to it. But sometimes, as it is today, it is better to track it personally, just in case."

"So, you're an unmanned vehicles analyst?"

"Coordinator. I am the unmanned vehicles coordinator. If necessary, I can even pilot them from a distance. But now, it's not required, the car itself … What the hell?" Boris muttered suddenly, squinting his eyes at the screen.

Something was wrong with the recordings. The lines began to repeat. Between them, gaps appeared. The point on the map suddenly moved forward sharply, then to the right. Then back to the point where it was a minute ago. It seemed that the car was teleporting from place to place.

"Oh-oh," Boris's fingers ran across the keyboard, and an image from a video camera popped up on the screen. It emerged and immediately froze: a lush nettle bush, nailed down by the rainstorm, stuck in the lens.

"Boris, what's happened?" exclaimed Veronica.

"Sensors knocked down! Rain confuses the car. It does not see where it is going!"

"So, stop it!" shouted Anton.

"I can't! It is not receiving signals right now. I'll try…"

And at this moment, the screen froze completely. The map faded; in the center of it, a loading wheel spun drearily.

"Lost it?" asked Anton quietly.

"Lost it," Boris answered. Sweat ran down his forehead.

"So, everyone, calm down," Veronica said in such a voice that it was clear that she tells herself to calm down, first of all. "This car will not drive off-road. It will stop."

"Not necessarily." Boris shook his head. "It can go for a long time, but it won't know where. Sooner or later, of course, it will break or stall, but by that time, it might already be somewhere near Obninsk."

"Let's take a look at the preserved video from the car," Anton suggested. "To find out where it went."

Boris again displayed the video tab. The image was twitching and breaking down, the distorted noise of rain coming from the speakers.

"So. Here it turns off … moves along the bypass road …" muttered Boris, scrolling in spurts the video.

"And what's that?" asked Nika.

"Where?"

"This sign here."

"Speed limit, apparently. But … Damn, you're big-eyed!"

Despite the interference in the image, it was possible to make out that the traffic sign was damaged. On top of the indication of optimal speed, some wag drew a strange symbol that looked like a long arrow. After that, according to the video, the car made a sharp turn. Then, the video ended.

"Retro-punks showing off again," muttered Boris. "At least, now we know what it is. The car took graffiti as a turning sign and turned the wrong way."

"Why can't it find the way back to the road?" asked Nika.

"How will it find a way? It has no road, no traffic flow, no signs. No information could be interpreted."

Anton meanwhile pulled out a smartphone and quickly dialed the number.

"Hello! Hello. So that is, Kosinskoe, code twelve. Extract valuable cargo. Will it work out? Okay, good. Stay in touch." He put down the phone. He crookedly smiled. Diluting hopelessness, "communication services have an available helicopter, and the thunderstorm is not so strong, it can fly. It can fly over all traffic jams, take out the heart, and deliver it to the city border."

"Can't it go straight to the hospital?" asked Nika.

"No. Helicopter flights are prohibited within the city."

"But it doesn't matter," Veronica said. "On these streets," she highlighted several points on the map with a light pen, "the traffic is completely fluid. Anton, can we send a car there so that it picks the heart from the helicopter?"

"Just a second." Anton quickly typed the message on his smartphone. "I've sent a request to the hospital."

"All this is good," Boris said, "but it does not solve the main problem. I cannot find the vehicle. Not a single search method that I know will work with such bad weather."

"A helicopter could see it from the air," Anton said doubtfully.

"And in what radius will it search? Well, let's say in half an hour, it will fly over all the southern outskirts and find our little lost one. But it is a fatal waste of time. The heart will become unusable, the operation will not happen, and the person will be gone."

There was an unpleasant pause.

"Do you know all the search methods?" suddenly asked Nika.

"What do you mean?" surprised Boris.

"Well … I just thought … it's not you who made this car. Maybe there are some options that only the creators know about … and if they were asked …"

The three specialists looked at each other. Then Anton joyfully grunted and slapped himself on the knee.

"What an intern! Pretty sharp! Boris, dial telematics up."

Boris did not need to be spoken: he already dialed a number on the phone.

"So, Angela, here is the data on the car," Boris finished. "What do you recommend?"

"Well…," said a tanned brunette in a video chat window. She spoke with a drawl, but her eyes we're darting back and forth on the monitor: she was promptly analyzing the information."

"Look, in this model, in addition to the travel time, speedometers, and route diagrams, there are a couple more options I'll open."

"And what are they?" Boris asked, peering at the new data on the screen.

"Fuel consumption and electronic compass. If you understand how much fuel it has already spent and in which direction it is now moving, then, we will find out the direction and distance that he overcomes blindly!" yelled Veronica. "Exactly. This will not give you exact coordinates, but at least narrow down the radius in which to seek."

"Angela, you are precious! Thank you."

"So, it turns out … Ten to fifteen kilometers from Kosinskoe highway to the east. I give the go-ahead to the helicopter!" Anton was delighted.

At first, Nika thought that nothing could be compared with the tension that was in the air when the self-driving car with the heart was lost. She was wrong. Waiting minutes were many times harder. Somewhere in the weird weather, an exclusive helicopter was tearing through

rain and darkness, looking for the car lost on the off-roads, but they could only sit and wait in tense silence.

In the thick, sticky silence, the telephone rang like an explosion. Nika shuddered, all eyes turned to Anton's smartphone. The man rushed to the phone, nearly knocking over the table. Silently, he listened to the man on the other end of the line. Silently hung up and turned to the colleagues. His face was so exhausted that it was impossible to read anything — relief or despair — on it.

"Anton, don't torture us now!" Veronica could not stand it.

Anton exhaled heavily.

"They found it."

The general sigh of relief was quiet but tangible: in the control room, it seemed as though it immediately became easier to breathe.

"In five minutes, the heart will be on the city's border," Anton added. "The car from the hospital is already waiting at the point."

"Damn, now I need mint tea for relaxation," Boris said.

"Me too," Veronica added.

A couple of minutes later, when the delighted specialists sat down to drink hot tea, Nika finally decided to ask a question that bothered her from the very beginning.

"Listen … Do these situations often arise? Well, when you need to decide literally in minutes?"

"Actually, rarely," said Veronica. "Now, automation on the roads and in cars does most of the work. We just have to ensure that the system does not fail, and it will do the rest."

"So, people are less and less needed?"

"You know, it's like with security rules. In nine out of ten cases, they are not needed. All the precautions are for the tenth time when something goes wrong. So, it is the same with us: for a month, we just collect recordings, and then in an hour, we save someone's life." Veronika smiled with poorly concealed pride.

Bunny ears appeared from the door, and Nika confusedly smiled.

"Oh, I have to go." She waved a hand to the dispatchers, and they raised their paper cups with a fun greeting.

TASK

Make up similar stories based on the following cases and the list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the room where the heroes work be like?

- What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. You are asked to change the road surface in the city center to the smart one. To do this optimally, you need to understand where traffic jams and accidents occur more often. To do this, analyze the data from the cameras.

VISION OF THE FUTURE

We travel more often and make more and more demands on the speed, safety, comfort, and economy. The development of IT solutions creates new opportunities for managing transportation infrastructure and logistics processes. Smart transportation systems are already being introduced in large cities, combining video cameras, GLONASS sensors in urban transport, traffic intensity sensors on the roads, computers that process big data and identify problem areas, etc.

All of these will help unload the transport system, reduce traffic jams, and make public transportation safer and more comfortable for citizens. For example, there are projects of smart bus stops that use Bluetooth or special tags to recognize phones of visually impaired passengers and read aloud to them all the necessary information.

With the help of special sensors, buses can already inform traffic lights that they are behind schedule, and traffic lights adapt to latecomers. And with the help of ticket validators, it is possible to calculate how many people get on the bus/trolley at each stop, which helps to optimize the schedule.

To reduce the environment load and save people's money on the purchase and maintenance of private cars, sharing services are developed. Already in large cities of Russia, it is now possible to rent for short-term cars, bicycles, electric scooters, etc., and over time, this practice will spread everywhere. More electric vehicles, hybrids, and biofuel vehicles will also appear.

Thanks to the built-in telematics systems, cars can send their coordinates, information about what is happening on the road, and inside the car, for example, about speed changes, braking, accident, functions running in the car, etc. This will help to better understand the causes of accidents: traffic police and car insurers will have data on the drivers' behavior.

In addition, self-driving vehicles will soon appear on the roads — safer and more predictable than regular ones. According to Google, they will be 90% less likely to get into accidents.

Not only the tech inside the transport but also the surface of the roads become smarter. Adaptive road surfaces (equipped with sensors and solar panels), lightweight, heavy-duty constructions, and high-tech lining of cars and wagons have already begun to be used. Smart roads will replace cartographic services to directly transmit traffic-related information about the situation on the road to the car (traffic jams, slippery roads, accidents, etc.), so the driver will be able to choose the route and make decisions more efficiently. Given the forecasted increase in the number of self-driving vehicles, it is the perfect solution.

Railways are also developing. Trains on magnetic levitation (maglevs) move due to the electromagnetic field created by powerful magnets laid under the track. Such trains do not touch the ground, so they do not lose speed due to friction and can accelerate up to 600 km/h. There are already working maglevs in China, Japan, and South Korea. By 2027 Japan is also planning to launch a line of the magnetic levitation railway, which will connect Tokyo, Nagoya, and Osaka.

In Russia, the Autonet market of the National Technological Initiative is actively involved in the development of land transport, which brings together representatives of the state, business, and the education system. The objective of Autonet is to create an effective ecosystem of consumers and suppliers of service, systems, and modern vehicles, based on intelligent platforms, networks, and infrastructure.

CROSS-PROFESSIONAL SKILLS

1 Systems thinking

2 Cross-industry communication skills

3 Project management

4 Lean production

5 IT

6 Customer focus

7 Multilingualism/ Multiculturalism

8 Social skills
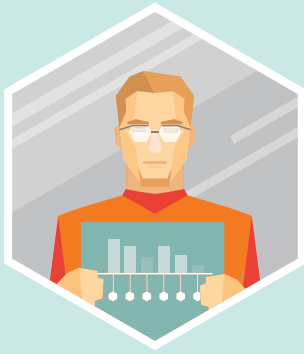
9 Working in uncertainty

10 Art and Creativity

11 Ecological thinking

TRANSPORT NETWORK SECURITY ENGINEER

A specialist in analysis, calculation, and monitoring of information, environmental and technological threats to transport networks. Unlike road safety experts, these engineers analyze and prevent problems associated with the functioning of the infrastructure of transport networks in general. Security standards change as networks evolve, and attention to the environment grows.

CROSS-PROFESSIONAL SKILLS

TRANSPORT SYSTEM MODERNIZATION SPECIALIST

A specialist who plans and implements the most advanced technical solutions in the existing transport system: digitalizes it, shifts transport to use more environmentally friendly fuel, implements video cameras and sensors, etc.

CROSS-PROFESSIONAL SKILLS

TELEMATICS DEVELOPER

A professional who develops and optimizes telematic on-board devices for the remote diagnosis of parameters, such as fuel consumption, speed, tire pressure, etc., as well as for the swift transfer of information about accidents. This will increase road safety level, and traffic flows management flexibility.

CROSS-PROFESSIONAL SKILLS
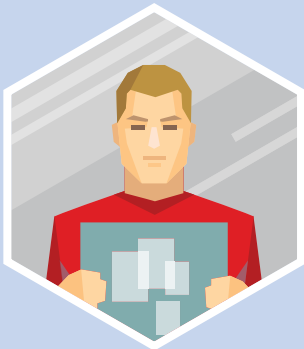
INTELLIGENT MANAGEMENT ARCHITECT

A specialist who develops software for traffic flows management systems. He or she controls intelligent management systems that aggregate various types of transport into an integrated network. In this network, you can monitor the load uniformity, control security, and, if necessary, rebuild the system according to the current requirements and threats. In particular, due to the implementation of the MindSphere intelligent system, London Heathrow Airport has begun to save about 3 million pounds per year.

CROSS-PROFESSIONAL SKILLS

INTERMODAL TRANSPORT HUB DESIGNER

A professional who designs intermodal transport hub projects (connection systems from one transport type to another), calculates their capacity, durability, and evaluates their development potential.

CROSS-PROFESSIONAL SKILLS
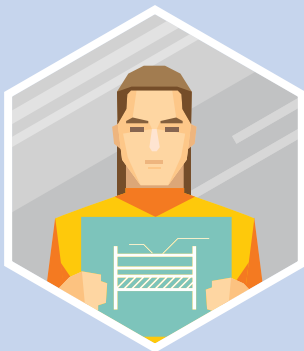
SMART ROAD BUILDER

A specialist who chooses and installs adaptive road surface, marking, and road signs with radio frequency identification, surveillance systems, and sensors for monitoring the condition of the road.

CROSS-PROFESSIONAL SKILLS

DESIGNER OF TRANSPORT COMPOSITE CONSTRUCTIONS

A specialist who develops constructions (frameworks, lining, parts) made of composite materials with a given weight, strength level, durability, etc. Composite materials are still used for various types of vehicles, and experts are actively looking for new ways to use them.

CROSS-PROFESSIONAL SKILLS

HIGH-SPEED RAILWAYS DESIGNER

A specialist who designs tracks, interchanges, and stations for high-speed railways. He or she works considering the territory specifics and climate conditions.

CROSS-PROFESSIONAL SKILLS
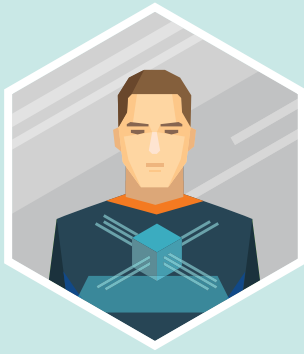
INTERMODAL TRANSPORT SOLUTION DESIGNER

A specialist maintaining intermodal freight and passenger hubs and transport facilities. His or her key tasks are to troubleshoot and fix possible faults in the complex and diverse transport infrastructure.

CROSS-PROFESSIONAL SKILLS
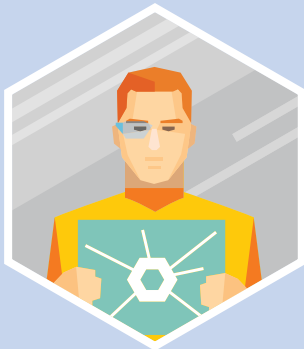
CROSS LOGISTICS OPERATOR

A professional who selects the best way to deliver people and goods, using different types of transport. He or she controls the movement of traffic flows, checks the capacity of transport hubs, and, if necessary, redistributes the flows of passengers and goods between different stops/flights.

CROSS-PROFESSIONAL SKILLS

OPERATOR-ANALYST OF TRANSPORT SOLUTIONS

A specialist who forms and builds a general transport map, using information received from AI. Such a professional should, at the same time, understand the functioning of various transport systems, be able to work with big data, and have developed communication skills, so, in case of a crisis situation, he could resolve it.

CROSS-PROFESSIONAL SKILLS

OPERATOR OF AUTOMATED TRANSPORT SYSTEMS

A specialist who controls and secures self-driving vehicles. He gets involved in case of any issues. If necessary, he corrects the data and redirects the vehicle.

CROSS-PROFESSIONAL SKILLS
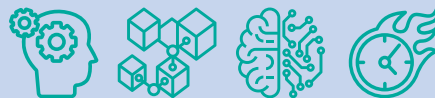
SPECIES
European goldfinch

POPULATION IN PARK

36

DIET
insects, yellow dock,
agrimony, thistle

ECOLOGY

The roborabbit began to descend, as soon as they were above the field. It rushed over a cluster of houses and released Nika. It didn't reach the ground a bit, but the girl was already used to his manners and easily stood on her feet.

She looked around. Wherever she looked, there were tall one-and-a-half of her height walls of corn. How to hint a robot so that next time she would be dropped off in a luxury hotel?

Nika jumped up, trying to peek behind the thickets of corn, looked carefully to see if something was there between them, but it was useless. The only remaining thing was to rely on luck, which each time brought her to the right place. Randomly, Nika chose the direction and walked along.

She was almost not surprised when, after a couple of minutes, she was on the road. An electric car was parked on the side of the road, around which people loitered.

"Girl!" the curly woman of about forty was delighted seeing her. "Girl, can you help us? The navigator went wild. We need Arkady Dubnin's farm, 'Golden Breakfast.' Do you know where it is?"

Nika already wanted to shake her head when she remembered the cluster of houses over which she had just flown with the roborabbit — there were no other buildings in the area.

"You need to make a U-turn and then turn left. Let me show you."

Nika was getting ready to bounce on bumps, as when traveling to her granny, but the road to the "Golden Breakfast" turned out to be smooth, well-groomed, and they reached the houses in just a couple of minutes.

"Here you are!" the burly man in linen clothes got amazed at their appearance. Apparently, this was Arkady. Before the adults got out of the car, he began to shake their hands. "Come in, come in. I've been waiting for you!"

"We almost got lost," nagged the pale guy in glasses. "Do you have a jammer here?"

"No, there's no jammers on the site," choked the man.

"Don't stress out," the pierced girl snorted out. "Everything is already fine with the navigator, just a little glitch."

Nika was sure that the glitch was not only little, but also with rabbit ears, but she preferred to remain silent.

"Thank you, we got help," the curly smiled, looking at Nika, and the man perked up again.

"This is one of our best workers!" He proudly raised his head as if he personally taught her navigation skills. "Well, come in, come in."

A city girl to the bone, Nika shunned and was even a little afraid of the village. What's to do there? No Internet, mud everywhere, cows and hens. The farm owned by the "giant" was breaking the usual stereotypes. Nice modern homes, comfortable walkways, a trimmed lawn. The people she met also did not look like the peasants in her mind: neat uniform, relaxed movements. And in their hands, they carried not sickles and scythes, but instruments unknown to Nika.

"You know," said Arkady, "I was a child, when this whole story with ecology began, but then the 'eco' was worth such a lot of money! And how much piggybacking on it … So, then I decided to make really healthy food. Healthy not for advertising only, but truly healthy."

They walked to the field, and the guy in the glasses perked up. He pulled a big case off his shoulder.

"May I?"

"Of course!" the burly man spread his arms. "I'm doing it properly. I feed my son with my breakfasts. Then he will inherit the farm. So, go wherever you want, take any samples. The main thing is to sign your certificate later." He laughed kindly.

Nika heard a familiar noise and then noticed a drone. She peered there as the same one was flying in the distance, over the next field.

"They are looking for pests," said the farm owner and immediately added, looking at the curly one, "We use only authorized means for pest control. The soil is also clean. If you want, check it out!"

"We are checking," the guy answered. He shoved something similar to Doctor Who's screwdriver from a science fiction series into the ground and looked at the indicators.

"Misha is an agricultural ecologist," the curly man explained to Nika.

"We do not use any pesticides." The owner carefully watched the actions of the guy. "We follow the agricultural cycles, and we plow the land correctly …"

The ecologist threw back the lid of the case, added the soil to the test tube, and moved on. He took another soil sample, pulled out something that looked like an old mobile phone with a wire from inside of his shirt, and probed the soil.

"So? Is everything alright?" asked Arkady when the ecologist put the last handful of soil into the case and slammed the lid.

"The baseline indicators are fine," the guy said. "More precisely, we find out in the laboratory. We will send you the results in a few days."

"So long!" Nika was amazed. She felt sorry for the obviously nervous host.

"It takes time to dry every sample," the ecologist pursed his lips. "You want a thorough check, right?"

"Okay," gave up the farm owner. "I know that we have everything hunky-dory. Now you will try it yourself."

Nika thought they would come back, but Arkady went on and stopped at the arbor overlooking the fields. A table was already set inside, and even at a distance, the girl could smell the hot boiled corn.

"Yummie!" Nika quickly finished the cob and reached for the next. A curly woman smiled at her but did not share her enthusiasm.

"I suggest starting," she said, turning on the tablet. "I am Daria Kuntseva, environmental responsibility consultant. My objective is to evaluate the environmental effect of your production and help to reduce it. Natalya," she pointed out to the pierced girl "our ecology logistician, will tell you how to make transportation less harmful to the environment.

"Mikhail, you have already seen in business." She turned the tablet to Nika with Arkady. "Now, Gustav will join us remotely. One of the best carbon market professionals."

"What markets?" asked Nika.

"Companies and even countries are now striving to collaborate with eco-brands. The lower your greenhouse gas emissions, the easier it is to set up exports. Gustav assesses the state of the market and indicates what restrictions may appear."

The screen lit up, and a red-haired mustachioed man appeared.

"Good afternoon!" the voice sounded slightly mechanical, and the lip movements did not coincide.

"Translator," the logistician whispered, noticing the girl's surprise. "Gustav is not good at Russian."

"So," the consultant raised her voice. "Let's start with the basics. I see that 82% of your production is local."

"Of course!" nodded Arkady. "Transportation leaves such an eco-effect!" He looked meaningfully at the logistician. "All that we can, we produce here. Near Samarkand, I have my apricot orchard. You should see what apricots there! They are golden, pure honey. Here is a lot of sunlight, but you can't grow them here, no." The owner stopped himself and added, "In Samarkand, we also strictly follow the standards. We deliver the freshest fruits, thanks to the planes. And here we process them using special technology and turn it into dried apricots. Breakfasts are stored for a long time, and vitamins are kept as if they just were plucked from the branch.

"Have you translated this correctly for me?" The carbon specialist raised his eyebrows. "Do you use airplanes?"

"Ye-e-s," said Arkady hesitantly. "They are more profitable. In order to preserve all the properties of apricots, you need to deliver them quickly."

"Planes leave a huge carbon effect." the consultant shook her head. "If you want to obtain eco-certificates, you have to refuse using the planes."

"What do you think about creating a unique production in place? Just nearby Samarkand," the logistician proposed. "You can deliver dried apricots by train and reduce carbon emissions by 29 times."

"Then we have to increase the cost of our products," remarked Arkady gloomily.

"Not at all," the consultant responded. "The environmental subsidy will cover part of the cost of production. The authorities of Uzbekistan are interested in keeping the workers in the country, and it is possible to discuss preferential conditions with them. And after receiving the certificate, we will make you a tax deduction."

"Helpful!" said Nika. "It turns out that there is no difference then, right?"

Arkady noticeably perked up:

"Okay! All for saving the planet!"

"And then we get to the second question — the use of thermal power plants. We understand that you cannot completely abandon it. But TPPs cause severe environmental damage. You can significantly reduce damage if you start using wind generators and solar panels," said the consultant.

"Listen," Arkady frowned. "I understand talking about transportation. I won't argue here. But why is the TPP such a problem? I'm not the only one using it. Who cares? As if I had a giant corporation here."

The consultant shook her head. "It just seems like the actions of the small companies are not so important. If everyone reduces their ecological effect, it will significantly improve environmental forecasts."

"Let me speak for myself! My business is to produce delicious and eco-friendly breakfasts. But what does the TPP do? Please ask the TPP management."

"You can't build environmentally friendly production and not think about the world around you. Everything is connected. Emissions from fuel combustion at thermal power plants enter the atmosphere, enhance the greenhouse effect, and cause acid rains that spill into the river from which you take water."

"Don't mess me around. I saw the results of the tests." the owner raised his head. "Everything is alright there."

"So far, yes," the consultant gently agreed. "Now, the concentration of toxins is not so significant. But the effect is accumulating." She looked at the man's eyes. "You said that you wanted to pass the company on to your son. But perhaps, no one will give him certificates then. If you really are building the business for decades, you have to think about it now."

Silence rose in the arbor. Arkady frowned, looking at others, and pursed his lips.

"And what do you suggest?" He asked reluctantly at the end.

The roborabbit did not appear, and Nika asked the ecologists to bring her to the place where the robotic rabbit left her.

"Great, you've got it!" said the girl, sitting down next to the consultant. "And even I was impressed."

"I did not push. I've just said as is," snorted the curly. "It's a dangerous misconception that you can hide in your house, and then the environmental situation will not involve you. If we had begun all this not in the twenties, but earlier, the planet would have been much better."

"Well," said Nika embarrassedly, "all of your programs did not exist at that time."

"Not to take a plastic bag, to refuse a straw in a cocktail, to separate garbage and bring it for processing — it is already a substantial value." The logistician winked at her. "Even small changes are important."

The car stopped.

"Drop you off here?"

"Yes, thank you. Right here."

The robotic rabbit was chasing drones over the fields.

TASK

Make up similar stories based on the following cases, the vision of the future, and the list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the room where the heroes work be like?

- What conflicts and surprises can arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. A tropical island in the Indian Ocean was severely littered with garbage from tourists. This threatens the rare species of coral fish, lemurs, and parrots that are on the Red List. It is necessary to organize a very smart clean up and attract volunteers to remove the garbage, and also send veterinarians to the island.

VISION OF THE FUTURE

Environmental problems have transformed from a headache of eco-activists into a task that the whole world solves together. In the report "Global risks — 2019" at the World Economic Forum, four of the five most important global risks are environmental. And according to the WWF Living Planet report for 2018, wildlife populations declined by 60% just between 1970 and 2014.

It is already impossible to deny that unconscious human activities are destructive to the planet and jeopardize our own existence. Therefore, in developed countries, a green economy is being introduced, contributing to the restoration of nature and saving resources. The results of studies conducted by the International Labor Organization show that the transition to a green economy will create about 18 million jobs by 2030, which, in addition to environmental benefits, will increase the level of employment.

Taking care of the climate, more and more countries and regions are introducing regulatory systems based on the amount of greenhouse gas emissions (in absolute terms or in the form of specific indicators per unit of production). In order to reduce emissions, some countries use quota systems, i.e., quantitative restrictions on carbon emissions that can be traded with other enterprises. In others, carbon emissions are taxed, and their reduction is encouraged by benefits and privileges. All these affect investment flows and product markets, and in some cases, can serve as a serious barrier to the export of goods and services. In addition, many companies have voluntarily united in mitigating the effects of climate change. Initiatives such as Climate Action 100+ (a community of investors) have urged their companies to reduce greenhouse gas emissions.

The volumes of oil produced and transported in the coastal territories and on the shelf will increase, which means that the risks of animal death in case of an environmental disaster will also increase. Additional monitoring measures to keep animals away from contaminated regions, and the work of rehabilitation specialists for those animals that have been infected will be required.

In addition to the mainstream environmental problems like climate change and deforestation, there are new threats that only relatively recently began to worry the specialists. For example, in 1997, experts discovered a large Pacific garbage spot. Due to ocean currents in the territory, which occupies about 1.6 million square kilometers (it is like half of the European part of Russia), there are millions of tons of plastic. Most of the debris is small particles of plastic that enter the food of fish and jellyfish and can be toxic. To cope with such threats, highly qualified specialists are needed, to be able to make decisions in the face of uncertainty.

Studies show that even the most damaged territories can recover if human activities are limited there. For example, the area around Chernobyl has already recovered significantly after the 1986 nuclear disaster. Moreover, the populations of moose, roe deer, and wild boars for 2015 are not much different in number from populations in uninfected uninhabited territories. Even Przhevalsky's horses have returned to the area. In general, this gives a reason to think of what is worse for the nature: an accident at a nuclear power plant or simply the presence of a human. If we can somehow compensate for our intervention, it is at least by using modern methods of environmental restoration: bioremediation technology allows cleaning of the air, water, and soil with the help of living organisms. For example, for soil bioremediation, using special equipment, oxygen can be introduced into contaminated soil in order to stimulate the growth of microorganisms.

Modern technologies allow us to care about the environment better. Miniature sensors, such as accelerometers, gyroscopes, magnetometers, microchambers, and barometers, track the movements of animals with unprecedented accuracy, provide data on their quantity, migrations, and behavior and promptly take measures to protect them. Technologies also help monitor the status of forest formations and monitor groundwater reserves.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

ECOLOGIST-LOGISTICIAN

A specialist who is responsible for reducing the environmental effect caused by the transportation of goods (CO_2 emissions). He or she develops logistics solutions, optimizes routes, and supply chains to reduce emissions. The population is growing, trade relations between the regions of the world are strengthening, so the need for the development of transport services and the need to monitor the environment will only increase. Therefore, the demand for this profession will be more and more compelling.

CROSS-PROFESSIONAL SKILLS
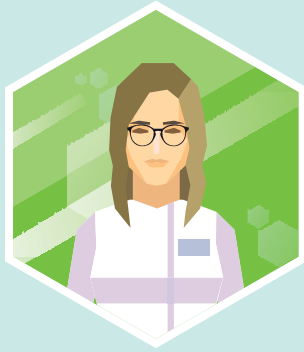
SPECIALIST IN OVERCOMING SYSTEMIC ENVIRONMENTAL DISASTER

An engineer working with disasters that are stretched over time and gradually realized by people: for example, pollution around large industrial centers, the Pacific plastic dump, melting permafrost, radiation dumps, etc. The specialist's tasks include the development and implementation of programs in order to cope with the consequences and prevent the recurrence of such disasters.

CROSS-PROFESSIONAL SKILLS
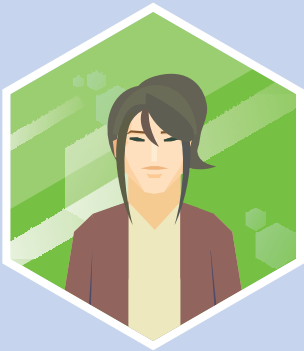
SPECIALIST IN CARBON MARKETS*

This specialist will monitor the situation on international and national markets and changes in legislation, assess the risks for business in current and potential countries of presence.

CROSS-PROFESSIONAL SKILLS

* The carbon market is the market for carbon emission rights, which allows to take into account all emissions, limit their volumes, and charge companies for them. Countries can sell each other's permits for a certain number of emissions (taking into account existing quotas), which allows solving various business problems and, at the same time, reduce greenhouse gas emissions.

CLIMATE RISK INSURANCE SPECIALIST

A specialist who develops insurance products for a business exposed to risks due to abnormal weather conditions associated with global warming. Insurance and construction companies are interested in foreseeing extreme climate and weather events so that climate risk insurance will become an integral condition for sustainable business development.

CROSS-PROFESSIONAL SKILLS

ECOSYSTEM SERVICES AUDITOR

A specialist who analyzes natural resources in terms of what services they provide to a human and estimates its value. Such a specialist assesses ecosystem services and their value, determines who benefits from them, develops compensation methods, and monitors their implementation. For example, forests in a region provide services to the population, including those that absorb carbon and produce oxygen. The population can give back to the forest for this service, protecting it from deforestation and planting new trees.

CROSS-PROFESSIONAL SKILLS

ECO PRODUCER

A specialist who makes up and implements educational and enlightenment projects in the field of environmental protection, coordinates the production of content (teaching aids, textual, photo and video materials, reference books, etc.) and technological solutions, as well as organizes environmental restoration events, such as community clean-ups and tree planting.

CROSS-PROFESSIONAL SKILLS

SOFTWARE DEVELOPER FOR ENVIRONMENTAL PROTECTION

A specialist who develops and maintains environmental information systems and databases, as well as sets up new programs necessary for solving environmental problems. Examples of these solutions include the KEDR system for monitoring illegal deforestation, the Irbis electronic database of snow leopard passports, and the gathering and analysis of data from camera traps.

CROSS-PROFESSIONAL SKILLS
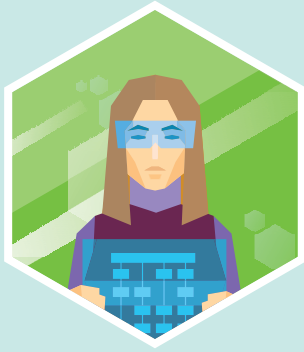
ZERO WASTE MANAGER

A specialist who designs and implements industrial and household waste management systems that allow reducing waste to zero. Representatives of such a profession already exist in the world; for example, the San Francisco City Hall has a "zero waste" department. Formally, the importance of preventing and reducing the generation of waste and its processing is written in Russian legislation, but so far, there are no real steps towards "zero waste."

CROSS-PROFESSIONAL SKILLS
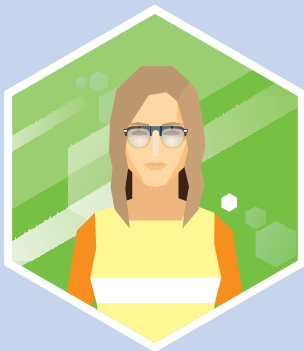
MANUFACTURER ENVIRONMENTAL RESPONSIBILITY CONSULTANT

A professional who is responsible for providing the public with environmental reporting from business, creating programs to increase responsibility, ensuring environmental control of supply chains and contractors. As environmental responsibility becomes a part of government policy, the demand for highly professional specialists to ensure it will increase in companies.

CROSS-PROFESSIONAL SKILLS

BIOREMEDIATOR

A specialist who restores ecosystems using biotechnology (in particular, using microorganisms, plants, and mushrooms).

CROSS-PROFESSIONAL SKILLS

AGRICULTURAL ECOLOGIST

A specialist in the development of principles for the disposal of agricultural consequences; is also involved in soil restoration.

CROSS-PROFESSIONAL SKILLS

PARK ECOLOGIST

A professional, whose tasks include monitoring and analyzing the ecological state of public spaces (parks, squares, alleys, etc.), developing and implementing solutions for landscaping, populating the territory with animals, birds, insects and taking other measures to maintain the ecological balance on green territory inside the city. For example, the London organization The Royal Parks, a charity created to manage and fundraise for London's eight city parks, have its team of ecologists, whose task is to take care of 418 rare species of plants, animals, and mushrooms. However, this specialty can be considered a new variation of the long-established profession of "urban ecologist," which appeared in the 1970s.

CROSS-PROFESSIONAL SKILLS
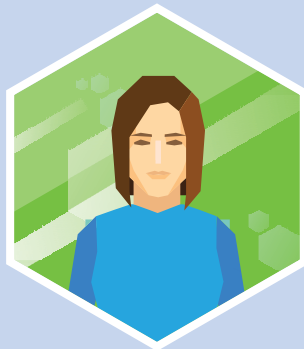
ECOLOGIST URBANIST

Designer of new cities, based on environmental biotechnology. He or she specializes in the fields of construction, energy, and pollution control. This profession is already in demand now as high-tech green cities have been designed and built-in Malaysia, China, the United Arab Emirates, India, South Korea, and European countries.

CROSS-PROFESSIONAL SKILLS

REHABILITATION VETERINARIAN

A specialist in the rehabilitation of wild animals affected by oil spills. Oil companies will create special training programs for veterinarians to work in extreme situations. In this case, it is important to assess the situation correctly: in many cases, it is better to make an effort on timely keeping away animals from pollution zones. Nevertheless, already affected animals will also need to be rescued.

CROSS-PROFESSIONAL SKILLS

AGRICULTURAL ECOLOGIST

A specialist in the development of principles for the disposal of agricultural consequences; is also involved in soil restoration.

CROSS-PROFESSIONAL SKILLS

FOOD INDUSTRY

This time, Nika again got into some building. She landed in the middle of a spacious office room with warm color furniture. Four sat at a long wooden table. Behind them, there was a wide monitor. Nika suddenly felt like being at an exam or interview. But the people at the table looked relaxed and not at all strict.

"Hello, trainee." an elderly man in glasses, sitting in the center, nodded to Nika. A thick, cozy vest reinforced his resemblance to a pediatrician or with a psychologist, as they are portrayed in caricatures. "I am Vardan Gegamovich, a food behaviorist."

"Who?"

"I'm introducing healthy eating habits. Oh, here comes our client!"

Nika turned around.

An energetic woman squeezed through the door of the office with a rude but kind face. Behind herself, a woman dragged the imposing stout man with a sumptuous mustache. The man was rolling his eyes sadly as if he was going to a slaughter.

"God, I barely pulled him all by myself," the woman muttered. "Hello!" she greeted the committee sitting at the table.

"Hello," Vardan Gegamovich answered with a smile. "Please." he pointed to a chair.

The woman sat her husband down and immediately, without taking a breath, turned to the group:

"So, we eat pretty friskily, so we came to consult …

"Maybe I'll do it myself …" the man said sluggishly.

"You by yourself, do not remember what you eat! Always at work, sitting with your scripts! He writes detectives. As he starts, he forgets what the year is now."

"Galochka, but for what …"

"Yurochka!"

"So, let's keep order," Vardan Gegamovich suggested. "Who has health problems, Yuroch… your husband or you?

"Me." Yurochka frowned. "It's hard to breathe … I get dizzy in the heat."

"Recently, he fainted in the country house. I thought it was it; he drove himself to the grave," added Galochka with a strange glee, as if to say: then he would have realized!

"But what did I do?" Yurochka was wondering. "I don't even smoke, and I only drink when we make BBQ. Why I suddenly got sick, it was not clear.

"And BBQ, it seems you eat it often," said Vardan Gegamovich with a constant smile.

"Well … it happens, yes."

"And in general, how do you like your meat? Salty and well-done, right?"

For some reason, Yurochka fidgeted and lowered his eyes, as if he had been convicted of something shameful.

"It's clear. Most likely, you have a dietary imbalance. It is not bad; many people have it. What do you usually eat during the day?"

"In the morning, he has eggs with bacon, toasts," Galochka began enthusiastically. "In the afternoon, meatballs and salted home-made cucumbers. I make eggplant spread myself …"

The daily menu of Yurochka turned out to be large. Meanwhile, Yuri took out a tablet and began to write something in it with concentration, completely ignoring what was happening.

"What I would like to say right away," intervened a woman with an elegant bracelet on her left hand, sitting next to Vardan Gegamovich, "is it is actually very good that Yuri consumes a lot of home-made products from his country house garden. However, fresh vegetables would be better."

"But he eats oranges for dessert. Vitamin bombs," said Galochka proudly.

"It's better to exclude oranges."

"What?!" out of indignation, Galochka jumped so that Yuri looked up from the tablet for a second and began to look around in surprise. But then again, plunged into the screen. "What kind of diet is it that oranges are not healthy?!"

"Ecological. I am an ecological nutritionist. Tatyana, by the way. It is a pleasure." The woman introduced herself. "You see, oranges are, of course, healthy. But in our climate, they do not grow. The fruits that you take in stores are brought in from afar, usually by plane."

"So, what?"

"Fuel is being spent on delivery. And most of our fuels, unfortunately, are still harmful to the atmosphere. So, it turns out that your oranges break a hole in the atmosphere of the planet."

"Well, what does it have to do with us?!"

"Well, for example, the thinner the atmospheric layer is, the more powerful the solar heat that penetrates the planet." A slight irritation was heard in the voice of the eco-dietologist. "The sun shines hot and threatens human health. So, each of your oranges, of course, supplies Yuri with vitamins, but at the same time increases the likelihood that Yuri will have a heat stroke."

Galochka turned pale. Not depending on how she was acting before, it was evident that the illnesses of Yurochka were her sore spot.

"But don't worry." the eco-nutritionist softened. "Vegetables and fruits are now being grown in large quantities at city farms, right in the city. On these products, even in stores, there are special marks. I will give you a list. Just learn this principle so far: more home food, less exotic."

"And try to add broccoli to your diet," Vardan Gegamovich added. "It is a source of vitamins and is grown easily."

Nika understood that the behaviorist had touched the sensitive string of Yurochka's stomach: he suddenly got distracted, threw the tablet down, and jumped out of the chair.

"No, you know! I understand, like, if dumplings are not allowed. But I will not eat any grass! You know, I need the energy to work! Do you think making up stories of killing is easy?"

"Yuri, I understand you," said a calm young man in a neatly ironed shirt, sitting on the right side of the table, "but let's do an experiment. Try to eat broccoli from an orange plate."

The indignation on the face of Yurochka was fighting with curiosity.

"Why is that?"

"Sit down. I'll explain." the neat young man smiled.

Yurochka hesitated, but he returned to the chair and sat down.

"Let's see it in order," the neat young man began. He snapped the remote control, and the screen behind him lit up. "Do you know what neurogastronomy is? A lot of different factors take part in our perception of taste and even in a feeling of satiety or hunger." A table consisting of multi-colored squares appeared on the screen.

"For example, the last meal at dinner is better to eat from a blue plate. The blue color calms your appetite, and you feel fuller, even if you haven't eaten very much."

"And how else can he … well, eat less?" revived Galochka.

"The best is when you set the table, to watch for the contrast between food and dishes. Let's say a steak is usually dark in color. So, it is better to put it on a light plate, white or blue. But I would not advise to engage in losing weight. The main thing is to improve health, balance the menu, and thinner does not mean healthier."

"So, how do I eat broccoli?" Yurochka asked gloomily, not wanting to get away from an unpleasant topic.

"Better from the orange." The neurogastronomist was not embarrassed. "The orange color makes the taste of food brighter. From it, even broccoli can be tolerated. I know, I checked," he friendly winked at Yurochka. "And, of course, music."

"Music?"

"Yes. For example, at the end of dinner, it is better to listen to jazz."

"Jazz is quite something!" Yurochka suddenly got excited. "And who is better, Mingus or Coltrane? I still have Parker at home, and—"

"It doesn't matter." the neurogastronomist laughed, reassuring a jazz admirer. "It is important that the rhythm of the music relaxes and hints at the end of the meal. But a dessert is better with classical music. It allows you to focus on the inner sensations, so sweet is even sweeter."

"Um!" Yurochka seemed to be seriously curious about the idea of complementing food with music. "And what else can be combined with what? Can I have sprats with chanson? And mushrooms with a rock? Are there any deadly combinations? I will use this in a new series. Neurogastronomic murder …"

"The poisoned ones have not yet been discovered by science. But at the end of our conversation, you will receive a special table with the most useful combinations," the neurogastronomist promised, without changing his face.

"And also," a girl with a boyish haircut intervened, who was silent before that, "we will give you a guide to food rationalization and food sharing."

"To what and what?"

"Clara, to begin, introduce yourself at least," Vardan Gegamovich reproved in a kind way. "This is Clara, a food rationalization specialist."

"Look." the girl turned the tablet to Yurochka. "This is the food sharing application menu. If you are registered in the application, you can exchange information about your food stocks with other participants. If you have something in excess or, conversely, not enough, you can simply exchange with a neighbor."

"Natural exchange," Yurochka grunted. "Just like in ancient times."

"In fact," the specialist agreed, "it saves you money, improves socialization. And it saves natural resources. Food is not sent to the trash just because you did not have time to eat it or forgot about it."

"Tell me," Galochka wedged in again, "can it be explained to the child? My son has the same trouble, but he doesn't want to go to the gym."

"Of course, it can be," Vardan Gegamovich answered. Nika noticed that for some time, he was typing something on the computer, without falling out of the dialogue. "You can download Fast-Shop on your phone. It is practically a game. Put your food preferences in it, come to the store, and the application will give you a list. Healthy products earn you more points than harmful ones. You can also gather the basket against the clock if you want."

"And points?"

"They can be exchanged for prizes and bonuses. For example, get a discount on purchases or a gift from the cashier. At the cashbox, you can directly pay with this application, and even a card is not necessary — kind of shopping through the game."

Vardan Gegamovich clicked a key. Yuri's smartphone immediately buzzed.

"I've sent you the new diet to email. And the link to the application. And I duplicated it for Galina."

"Well, then what do we do next?" asked Galochka.

"Let's give the diet time to establish. Again, try our apps. Let's appoint the next consultation … in a month, colleagues?"

The specialists nodded in agreement.

"Tell me," Nika asked when the couple left the office, "are people not afraid? To believe in colorful tables and mobile toys?"

"Of course, they are." Vardan Gegamovich took off his glasses, and wearily rubbed his nose. "It's about their health. But here is the thing: before, people made big sacrifices to be thin, because it corresponded to the standards of beauty and was considered healthy. But each person has his own optimal weight, and it is important to listen to yourself and balance your lifestyle, rather than torture yourself with hunger. Our current methods do not require any tough efforts from a person, and they are easily acquired. In fact, a person just plays a game. Well, you saw how Yuri became interested in the idea of music."

"But such lures, probably, everyone has his own."

"Sure. And after all, we study the client before he comes to us. Social account, at least. Do you think that the neurogastronomist just randomly raised the conversation about jazz?" Vardan Gegamovich winked conspiratorially.

Nika involuntarily grinned in response, and then she felt the robotic rabbit rubbing against her knee. The ears themselves fell into her hands, and everything has mixed up.

TASK

Make up similar stories based on the following cases, the vision of the future, and the list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

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- What might the room where the heroes work be like?

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Case 1. There is a need to develop a vegan yogurt for Silicon Valley residents that would contain supplements that improve blood circulation in the brain. If the launch of the product is successful, it will be shipped to other countries.

Case 2. A famous actor loves chips terribly, eats them a lot, and this harms his health. He called specialists with a request to help him improve this habit and to fall in love with fruits instead.

VISION OF THE FUTURE

If current consumption trends continue, then, according to Greenpeace, by 2050, humanity will need the resources of three such planets like Earth. Thereby, it is necessary to balance between the desire to eat delicious food, environmental responsibility, and the need for nutrients. The population of the planet is growing rapidly. In order for everyone to have enough food, synthetic and unusual products will be actively added to food (for example, the use of insects for food is already being discussed). In addition, genetically modified plants and animals will be used, and the process of cooking products will be improved using biotechnology. The ecological issue remains relevant. Therefore, it will be necessary to control the quality of the raw materials from which the products are made and the safety of the production process itself.

Advanced consumers are making new demands on food: it should be not just not harmful, but ideally improve health and stimulate productivity. Hence, the growing demand for products enriched with vitamins, antioxidants, adaptogens, and other beneficial ingredients. From the point of view of evidence-based medicine, this is a gray zone, because studies do not unambiguously confirm even the beneficial effect of many well-known dietary supplements, and doctors do not recommend taking even vitamins without consultation. Nevertheless, since the human diet affects well-being, developments in the field of food, biotechnology enrichment will continue. In particular, great expectations are put on antioxidants that protect the body from the action of free radicals, and complexes of lactic acid and bifidobacteria that correct the microflora, preventing the development of diseases.

Eating meat is not quite ethically aligned and damages the environment (at least, it concerns the cattle breeding as farm animals produce more than a third of the methane released into the atmosphere, and this is a greenhouse gas). Not everything is clear with dairy products either — vegans and people with lactose intolerance avoid them. Therefore, technologies, allowing the production of synthetic meat, milk, cheese, etc. are being developed.

For example, at the BioCurious biohacker club, more than two dozen amateurs and scientists are trying to create their own recipes for vegan cheese from yeast. Impossible Foods makes believable vegetable hamburgers by genetically programming the same yeast to produce the heme protein molecule, which is responsible for the color and taste of meat. And the Clara Foods project creates artificial egg white that can be used for baking.

On the one hand, bio- and information technologies in agriculture and food production are developing rapidly, but, on the other hand, publicly available data for machine learning and standards for collecting and exchanging these data are very scarce in these sectors. One of the rare examples of such a development is the project of the Massachusetts Institute of Technology OpenAg Food Computer. Plants located in the OpenAg laboratory are grown in sea containers equipped with sensors and gadgets that are controlled using artificial intelligence. AI can control the brightness of light, temperature, humidity, and other environmental conditions and calculate the best options in order, for example, to grow the most delicious basil or the most fortified lettuce. This 'climate recipe' is open to the public so that any city farmer can use it. And the Japanese company OpenMeal in 2018 announced the "teleportation of sushi," printing sushi according to a recipe developed in Tokyo on a 3D printer in Texas. The company is currently working on creating the Food Base project, which allows users to exchange data on food products and send them to a printer to recreate dishes.

The current food logistics system is complex, inflexible, and tied to outdated technologies. Transparency Market Research reports that global supply chain logistics will grow to $15 trillion in 2023. However, many suppliers still rely on paperwork. The combination of distributed ledger technology and the Internet of Things will increase the efficiency of the supply chain by replacing manual customs checks and paper records. Food trader Louis Dreyfus conducted a trial trading of agricultural goods using blockchain in December 2017 and admitted

that this technology significantly increased the efficiency of logistics.

Already, to make an order at McDonald's, you do not have to ask the cashier, you can use the interactive display. In the future, human staff will remain only in "slow" cafes and restaurants, where people come, including in order to enjoy pleasant service, and fast food will be fully automated. For example, a robot from the Creator restaurant in San Francisco is already cooking 120 burgers per hour at a cost that is comparable to the price of a regular Big Mac. According to McKinsey Global Institute's partner, Michael Chui, in the restaurant business, it is now possible to automate 54% of the work performed by people, so the demand for robotics specialists who can create compact machines for cooking will grow.

Our brain has not changed much since cave times and still prefers fatty, sweet, and salty foods, and even the united efforts of nutritionists cannot change this yet. But, fortunately, biotechnology will soon allow us to create healthy alternatives to high-calorie treats: using natural sweeteners and unsaturated fatty acids. Besides, scientists and nutritionists are already developing mobile applications and educational video games that can change eating behavior; for example, the game Squires Quest!

II, encouraging the consumption of fruits and vegetables.

Tens of millions of tons of organic waste are generated annually at food and processing enterprises, and this is only in Russia. Organic waste is harmful to the environment, and it is a waste of resources. Therefore, developments that allow obtaining nutrients from food residues, converting them into new products, are now getting great interest from the food industries.

In the 21st century, we got used to a huge variety of food on the shelves of supermarkets, and it is increasingly difficult to surprise us with new tastes. Nevertheless, the potential for fresh sensations is still here. Neurogastronomy will help with it — a new direction that explores how the brain perceives tastes. For example, the context affects the taste — the appearance and texture of dishes, as well as the atmosphere, smells, and even musical accompaniment. Achievements of neurogastronomy allow us to live a completely new taste experience. First of all, it will be created by a specially prepared context, but in the future, appropriate neuro gadgets may appear: DARPA is already developing an implantable neural interface that can potentially transfer smells and tastes directly to the brain.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

FOOD SAFETY CURATOR

A specialist who ensures the future consumer safety of enriched and synthetic products in the production.

CROSS-PROFESSIONAL SKILLS
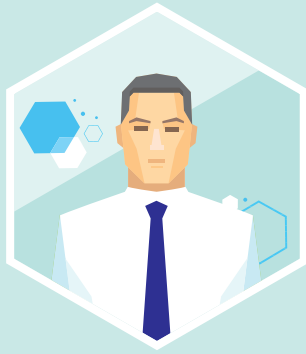
ENRICHED FOOD DESIGNER

This professional develops products enriched with beneficial substances that give an accumulative effect in terms of health and longevity. The designer of fortified foods should calculate the dosages of beneficial components, understand their impact on the body, derive the most easily digestible formulas, and make sure that the additives do not affect the taste of the product.

CROSS-PROFESSIONAL SKILLS
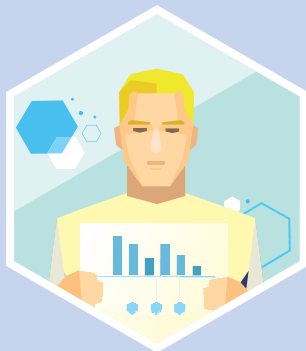
SYNTHETIC ANIMAL PRODUCT DEVELOPER

A specialist who creates analogues of meat, egg whites and yolks, and dairy products from plant materials or grows meat "in vitro" from animal cells.

CROSS-PROFESSIONAL SKILLS

FOOD PRODUCTION ALGORITHMS DEVELOPER

A specialist who develops universal algorithms for growing plants and producing foods, so these algorithms can be applied to automated farms and plants everywhere in the world.

CROSS-PROFESSIONAL SKILLS

FOOD LOGISTICS SPECIALIST

A professional who optimizes food logistics in terms of timing, quality control, transparency of supply, and environmental impact.

CROSS-PROFESSIONAL SKILLS

FAST FOOD ROBOT DEVELOPER

A specialist who creates robots that can cook pizza, hamburgers, and other fast food quicker and more accurately than humans.

CROSS-PROFESSIONAL SKILLS

ADVISOR IN HARMFUL INGREDIENT REPLACEMENT

A specialist who comes up with how to optimize the composition of dishes and replace harmful ingredients with healthy ones without losing the taste of the dish.

CROSS-PROFESSIONAL SKILLS

FOOD RECYCLING SPECIALIST

A professional who comes up with how to recycle useful organic compounds that are recyclable from food residues.

CROSS-PROFESSIONAL SKILLS

FOOD RATIONALIZER

A specialist who helps the population to reduce organic waste from cooking and process it (for example, more rationally purchase and store food, make compost from residues, etc.), and also teaches redistributing excess food in favor of those who need it (for example, using food sharing).

CROSS-PROFESSIONAL SKILLS

NEUROGASTRONOMIST

A specialist who creates a new gastronomic experience for customers, based on how our brain perceives tastes.

CROSS-PROFESSIONAL SKILLS
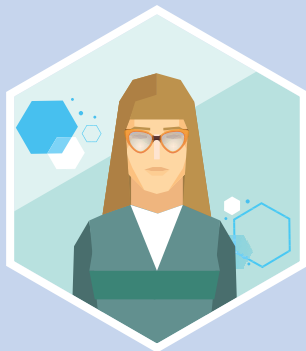
IT NUTRITIONIST

A specialist who creates virtual assistants who help choose menus according to the needs of a specific user. Such an assistant analyzes genetic information, mood, favorite tastes, energy needs, body mass index, and other factors. He will help improve nutrition, reduce food costs, and resist temptations more easily.

CROSS-PROFESSIONAL SKILLS
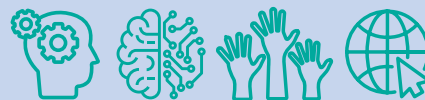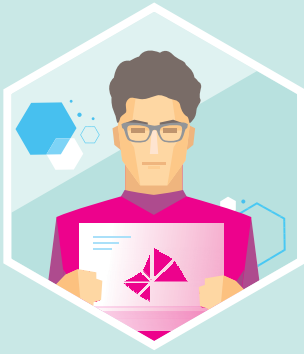
GAMIFIER OF HEALTHY EATING HABITS

A professional who is well versed in nutrition, psychology, and behavioral economics and helps clients switch to healthier eating habits (including both diet and reasonable food restrictions), including through gamification.

CROSS-PROFESSIONAL SKILLS

ECOLOGICAL NUTRITIONIST

A specialist who develops a balanced, tasty, and healthy diet, safe for humans and nature. Ecological nutritionists can come up with menus for particular clients or consult various companies and organizations to implement sustainable food production practices on a large scale.

CROSS-PROFESSIONAL SKILLS
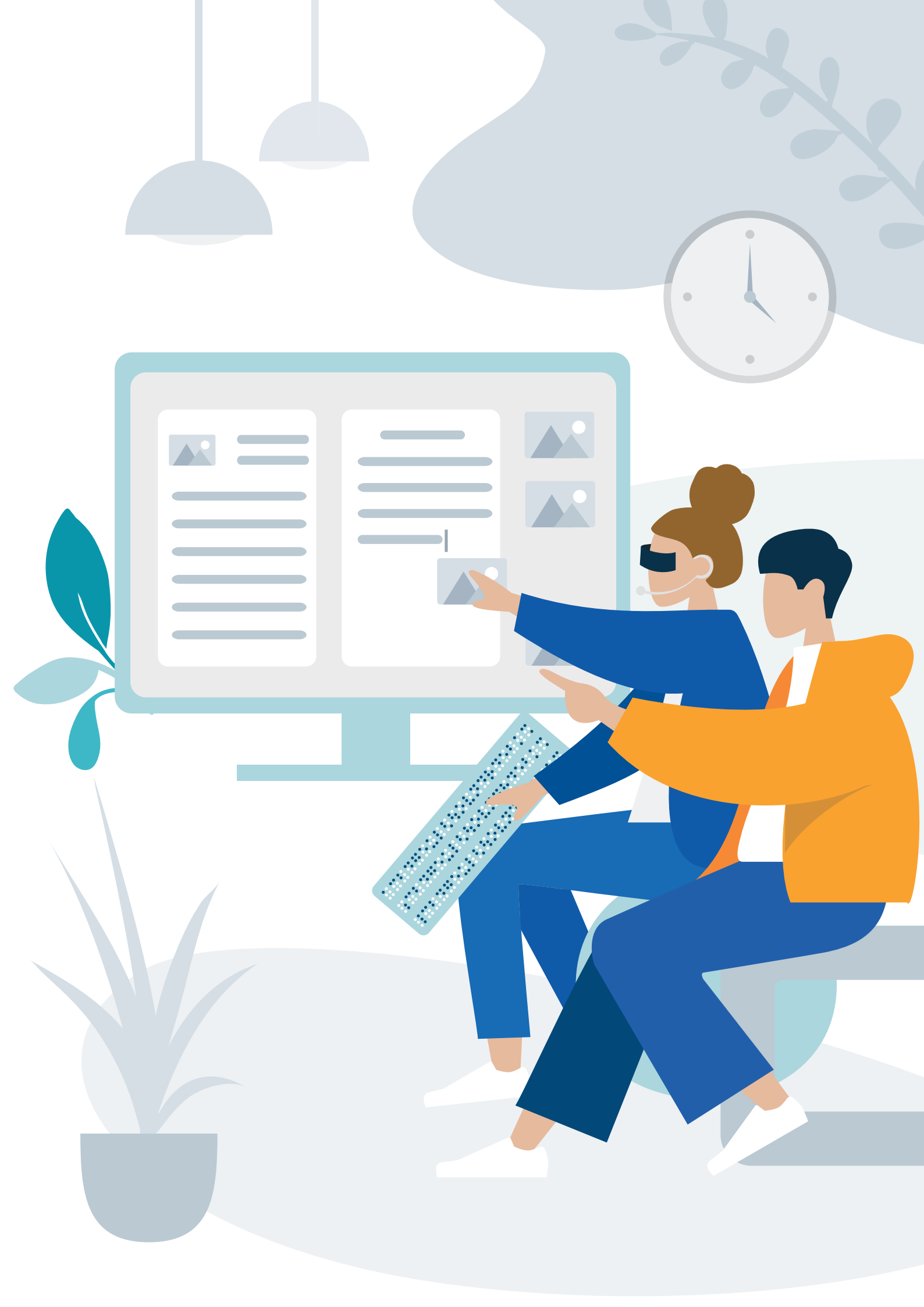
SOCIAL SPHERE

The sun reflected off the slabs of the high glass ceiling, glittered on the polished metal frame of the building. Nika felt dizzy from heights and fresh air. The abundance of greenery created the feeling that you were in the country.

"Where am I?" asked Nika, but the roborabbit had already gone somewhere.

"Good afternoon!" came a soft mechanical voice. The girl turned around and collided with the flat face of the android. "My name is Alena. Can I help you?"

"Where am I?" repeated the question Nika and embarrassedly added. "Tell me, please."

"You are in the department of social protection."

"This is a type of social security? Or, how was it, district?" Nika incredulously looked around the empty space and grunted. "And where is the line of old women?"

"The maximum queue size was fixed after the end of the May holidays, May 12, 2034, and amounted to three people."

Nika laughed and wanted to question the robot in more detail, but a beautiful, strict woman of about forty took decisive steps towards them. A young guy with a large freckled nose rushed behind her, barely keeping up. Nika moved away so as not to interfere with their communication with the android, but the woman came up to her and put her hand on her shoulder.

"And here is Nika," she introduced her to the freckled guy, "the head of the class, a social activist, she even writes to the school newspaper! Nika wants write a paper about our work. And I thought, let it be with you, look …"

"Of course, of course! It's great that they chose me. We have such a case brewing that will buck you up a bit …"

Nika looked doubtfully at the guy. She did not really know what he was doing but doubted that he would be entrusted with something fascinating.

"Moreover, to educate and instruct the new generation … I always believed that the most important thing …

"Well, you go," the woman was already typing some text on the phone.

"I hope your nerves are strong," the guy began as they left the Social Security Office. "But if anything happens, feel free to wait outside. I will understand. In our case, it's not enough just to knock, you know."

"And who are you? And what are you doing?" snorted Nika.

"Me? I …" the guy flashed so that the freckles seemed green. "Actually, I worked as a moderator of sharing platforms," he mumbled. "This … we help to rationally distribute products and there too … all sorts of things that have remained unsold."

"Sounds dangerous." Nika could not stand it.

"This was before. Now it is completely different. Since this year, I am a mediator of social conflicts. My task is to help people solve a difficult situation so that they do not have to use punitive methods."

"Like a peacemaker?"

The mediator nodded.

"Today, it is a particularly difficult matter. Fight! What would they do before? They would just put everyone in prison for 15 days, and this is the end. And today, there is a chance to understand, to understand the essence of the conflict."

"What is its essence?" shrugged Nika. "Our boys are constantly fighting. They just like to fight, that's all."

"Oh, the frequent fallacy of the philistines," leniently held out the mediator, and even raised his finger up for convincingness.

They reached a cozy, bright building. The girl faltered when she noticed the inscription, "Police."

"Should we go there?"

"If you want, wait outside."

"Well, no." Nika resolutely went ahead. She had not been in the police of the future yet!

The interior of the police station somewhat disappointed her. During the trip, Nika managed to get used to the abundance of natural materials, airy rooms, and plasma panels on the walls. If the unpleasant faces of criminals and safety rules were not broadcast on the screens, she would decide that she was in the next office. It's that the cell in the far corner slightly diluted the atmosphere, but it turned out to be empty.

"Hey!" the mediator called Nika. "Are you coming?"

Beside him, a policeman in uniform was trampled from foot to foot. He handed them sticker badges and led them down the corridor to the office with the words "Interrogation."

"I just don't know what to understand here," he grumbled, entering the room. "Everything is clear at first sight."

"Pay attention, Nika," said the mediator instructively. "Another common mistake! A true professional never make hasty conclusions."

The policeman frowned at the guy.

"Call me if you need anything. The materials are all on the table. It is not allowed to take them out of the station."

Without waiting for the door to close behind the policeman, the mediator rushed to the tablet.

"So, what do we have?" He began to leaf through the files. "By the way, how many photos do you need to send? And how much is the article? I think such a difficult thing will pull on long read, huh?" He suddenly sharply turned sour. "Hmm, maybe the policeman was right …" The guy turned the tablet over to Nika. A skinhead man with a grim look was looking at her from the screen. "Boris Mishukov, one of the participants in the fight. In childhood, he was registered with the police."

"What is wrong with him?" Nika did not understand.

"Look at the second one." the mediator turned the page and pointed to a photograph of a smiling black student in a mantle. "Kofi Appia, from the Ewe people. Two months ago, he moved to Russia. A shaved guy with a criminal record fought with a black graduate. Everything is clear here. I will contact specialists on the adaptation of migrants."

"What does their adaptation have to do with it?" surprised Nika asked.

"Guys help migrants get accustomed to Russia: they get acquainted with culture and language. Here, of course, the problem is different, but the guy also just moved, he does not understand everything, and this skinhead attack…"

"You yourself said that there is no need to draw hasty conclusions," said Nika, but the mediator was already looking for a contact in the messenger. He put the phone so that Nika could also be seen.

A woman with blond hair appeared on the screen. "Hi! What have you got there? But be fast."

"Skinhead had a fight with a black guy. The guy just came from Ghana; he's from the Ewe people. Any tips to somehow reassure them?"

"Firstly," the woman babbled, "please remember that migrants are not babies, and they also have no arrested development. No fussing and talking slowly. But it may well be that your client is not very good or does not speak Russian at all. Then switch to English, now almost everyone speaks it. Or, even easier, use an interpreter. It's also normal if he doesn't understand some obvious things for you. Yet our cultures are still very different. Secondly, this is not just a migrant, but a person who has experienced racial violence. We need to show him that this is a terrible but rare exception, and not the norm, that not everyone in Russia is like that."

"Got it, got it! Thanks!" the mediator got inspired.

He got up and clamped the tablet with the case under his arm.

"And now what? Going to Appia?"

"First to Mishukov," said the mediator, letting Nika into the corridor. "We need to find out exactly what happened."

"What for? If we already understand."

"We are not cops. It is not enough for us to find out who is to blame. You need to try to fix the situation. And for this, you need to hear Mishukov's version, understand his motives, and then try to convince… hold on." he handed Nika a tablet, and he went to the police.

The girl ran her eyes over the protocol. She frowned.

"Listen," she said when the mediator came back, "why did they fight inside the entrance? If they were neighbors, Mishukov had to see Appia constantly."

"Not necessarily," the guy answered, looking around. "Skinhead could go visit someone, run into Appia, and attack. Come, we should go there!"

They went into the office, similar to the previous one, with the only difference being that a gloomy man was sitting at this table. When Nika appeared with the freckled one, he threw up his head abruptly.

"Good afternoon," the guy said softly. "We are from social protection. I am a mediator of conflicts and would like to talk with you. Do you need anything? Water? To use the restroom?"

"Did you detain him? Is he here?" The shaved man asked abruptly.

"Who?" the mediator sat before Mishukov.

"That African guy."

"Why did we have to detain him?" the freckled one shook his head. "Just because he is black?"

For a few seconds, the shaved man silently looked at the mediator, and then exploded:

"Of course not! For beating the bride and her mother!"

"What?!" simultaneously cried out Nika and the mediator. He shot a warning glance at the girl and cleared his throat.

"I'm sorry," he said more calmly. "Could you tell me what happened?"

"Yes. I tried to explain to these idiots!" Mishukov flared up. "I am Mia's neighbor. I live through the wall from her and her mother. Mia is the guy's bride," the shaved man explained, noticing bewilderment on the faces of the audience. "So, a couple of weeks ago, I began to hear strange sounds in the evenings. It's like someone was crying. Well, crying and crying, right? It happens. But not every day! And recently I saw this man, Kofi coming to their apartment. Five minutes passed, and then the screams began, some kind of noise, like blows. He left, and they sobbed again."

Nika exchanged a glance with the pick. A shadow fell on a cheerful freckled face.

"So, what happened next?" he asked muffledly.

"I tried to talk to Mia, but she pretended not to understand anything. I saw she was lying. But what could I tell her? When Kofi came again, I could not stand it anymore. I caught him on his

way back, away from Mia and her mother. I just wanted to talk, but he started yelling at me! One word led to another... Well ... Here we are," Mishukov finished grimly.

"So, the point is not that he is black?" clarified Nika. "How do you feel about them?"

"What?" the shaved one looked at the girl and the mediator. "Normally, as to all people. I have a girlfriend of mixed race, what's wrong with that? What are you hinting at?!"

"For anything," the mediator intervened. "Of course, for anything. She said it wrong." He turned to Nika. "Could we have a word behind the door?"

The mediator squeezed her shoulder, persistently led to the exit from the interrogation room.

"Everything is not at all what we thought!" He breathed. "We urgently need to contact the manager of the crisis center!"

"Wait." Nika shook her head. "What kind of centers?"

"Places where victims of violence can stay in a safe environment. Psychologists talk to them there, lawyers help. If both mother and daughter cry, they urgently need to be isolated from Appia and provided with support."

"Maybe we should talk to them?" cautiously asked Nika.

"Well, no, we'll prepare everything first!" the mediator was furiously flipping through the tape. He brought the phone to his ear. "Hi, listen, we have a suspicion of domestic violence here. Where can I send them? Yeah. I get it."

The phone flashed, and the address appeared on the screen. "The main thing in such situations is to protect potential victims as quickly as possible. So now, let's go to this Mia. Since they live next to Mishukov ..." he did not finish. "Come on."

Nika followed the gaze of the mediator. At the entrance to the station, a black woman was arguing with the policeman.

"I don't care about your rules! My fiancé was detained for allegedly fighting!" She spoke with a subtle accent.

"Hello," the mediator approached them. "Are you Mia?"

"And who are you?" the woman gave him a suspicious look.

"I am a mediator of social conflicts, and I'm engaged in your groom's case. Could we talk?"

"Kofi wouldn't say boo to a goose! What fight?"

"Let's find a quieter place and discuss everything," the guy said softly. He made a gesture to the policeman, and he pointed to his office.

The mediator put the agitated woman in a chair, offered water, and only then continued the conversation.

"Why do you think that Mr. Appia could not become a participant in the fight?"

"Because he is kind as a puppy." Mia smiled sadly. "Even his friends laugh at him; they call him henpecked."

"Oh, do they?"

"Does it surprise you?" Mia snorted. "We speak excellent Russian, and most of our friends are local. And yes, I know the word henpecked."

"Sorry," the mediator choked. "In no case did I want to offend you. How does Appia feel about your environment? For example, to the neighbors."

"It's great. He easily agrees with everyone," Mia answered in surprise. "What a strange question. What do the neighbors have to do with it?"

"Despite the fact that he had a fight with one of them, Boris Mishukov. Do you know him?"

"With Boris?" Mia did not believe it. "Because of what?"

"Do you have any assumptions? Perhaps you quarreled with Appia yourself? Or were there any problems?"

"He never quarrels with anyone!" Mia jumped. "He's not fighting anyone! I don't understand what you are doing here, but I have the right to see my fiancé!"

"We know that he hits you!" blurted out Nika.

"What is he doing?" Mia asked quietly, at once having lost all fuse.

"We know that he hits you and your mother," the girl repeated. "Do not worry; we have already contacted the crisis center. They will help you!"

"Listen, you," Mia spoke in an icy tone, "Kofi never once laid a finger on me, or mom, or your Mishukov. And if you only dare to blame him for something, I will drag you through the courts. I will contact the prosecutor's office, the Ministry of Foreign Affairs, and even the president! Do you understand me?"

"Mia, please, let's talk," the mediator tried to temper her, but Nika again could not stand it:

"If he doesn't beat you, then why are you crying?"

"What am I?" the woman stopped short and suddenly laughed. "Crying? Crying? So that's what the whole thing is about!"

"I did not …" the mediator was confused. "Is this some kind of joke?"

Mia sank into the chair, still chuckling. She covered her face with her hands.

"I knew this was a bad idea!"

"Please, tell us," the mediator asked.

"What can I say … Our mothers, mine and Kofi's, are from the Ewe people. And before the wedding, they have a ritual of mourning the bride. A month before the wedding, the bride and her mother begin a ritual cry for the fact that the old life ends. And the groom must prove to the spirits that he is worthy of a wife. Screaming at the bride's home idols, ritually beating them. It's not that we believe all this, just … we won't have a wedding according to the rules. Kofi is in graduate school, I'm still studying, but we don't want to ask parents for money. So, they wanted us to do at least something."

"That means your sobs—"

"… were ritual!"

"And no one beats anyone?" rejoiced Nika.

"Only spirits."

"So," said the mediator, "I think we need to talk to everyone together."

He contacted the police. They brought the gloomy Mishukov and the worried, understanding Appia. Nika was waiting with interest for what would happen next, but the mediator kicked her out in the corridor.

"But what about the article?" the girl grabbed the straw, but the guy resolutely closed the door in front of her.

They managed quickly. Within a few minutes, the door opened again and satisfied, albeit embarrassed, Appia, Mia, and Mishukov left the office. The shaved man shook Kofi's hand, nodded to the mediator, and headed to the exit.

"You see, with proper skill, it's not so difficult," the freckled grunted.

"And what is that 'easy?'" Behind him, a stern woman appeared that represented Nika. "Explain why in the last half hour you sent a request to the migrant service, the crisis center, and we received a complaint from an elderly woman that her daughter and son-in-law were illegally detained?"

"Oh," Mia said, embarrassed, "Mom was probably scared."

"We got a little misunderstanding here," muttered the mediator, taking the boss aside. "The fact is that…"

He managed to tell the story in a few minutes. With each new turn, the woman frowned more and more, and in the end, Nika began to seriously fear for the future of the freckled one. "All clear. Should I explain to you what you did wrong, or do you understand?"

"It was necessary …" the mediator glanced at Nika. "We had to figure it out first, and then to get in."

"Right."

"Maybe you can somehow compensate them," intervened Nika. "Help with the wedding?"

"Right!" the mediator was delighted. "Help with the organization! I'll call the guys from the sharing platforms; they'll probably come up with something. We will help them with the decor and products. I will, now!" He was rushing to the groom and bride, but the boss caught him by the elbow.

"Contact the platform first and see if they can help."

"Yes, exactly."

The woman just shook her head.

"So, write it like this: the work here is hectic, crazy, but interesting."

"Certainly." Nika smiled. Behind the back of the police, her robotic rabbit jumped impatiently.

TASK

Come up with similar stories based on the following case study, vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the room where the characters work might be like?

- What conflicts and surprises may arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. You need to provide all visually impaired people in a small town with Braile displays and keyboards. You plan to use crowdfunding in order to raise funds for that. After that you need to teach these people how to use this equipment and help them find remote jobs.
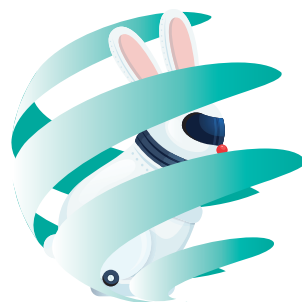
VISION OF THE FUTURE

Traditionally, the conservative sector of state and social services has changed a lot with the development of information technologies. But this is only the beginning of a long journey.

Firstly, the work of these services is becoming more transparent. Now, you can report your problem on an online platform (say, indicate a broken road or lack of street lighting) and get a report on its solution there. Or follow the progress of the reform and leave your comments. In Denmark, up to 98% of requests from business and the public to government institutions are already received through online services, and in Estonia, up to 99%.

Secondly, it becomes possible to involve citizens themselves in the solution of individual social problems and the management of districts and territories. This applies to both the initiatives proposed above and the self-organization of people who have decided to implement an idea. For example, there is the "Lisa Alert" volunteer project for searching missing people, or the "IT volunteer project," where volunteers can choose a specific charity task in the IT field that they would like to work on. At the same time, it is now possible to solve more targeted problems — for example, to provide assistance to a specific person with a disability or a low-income family. Also, a subscription charity system is increasingly being used, where a person can set up automatic monthly charity payments, which saves users time and emotional resources and allows funds to collect assistance more efficiently.

Thirdly, the emphasis shifts from the possibility of possessing various benefits to ethical and informed consumption. Now it is not enough to wear a fashion label to declare itself: it is more important whether the brand is harmful to the environment and does not use child labor. More and more people feel a share of personal responsibility for what is happening in society and are looking for information that would help make a more ethical choice. The sharing economy is spreading when people share things with each other or rent them out so as not to buy. For example, the practice that is quite popular in Moscow is the so-called swaps, where people exchange unnecessary clothes. In addition, large cities (including Moscow and St. Petersburg) have a food-sharing network that allows citizens to share excess fresh food. State and municipal authorities also try to popularize environmental practices among citizens, such as a separate collection of garbage, community workdays, etc.

Due to globalization and increasing mobility, people of different nationalities and cultural backgrounds may be neighbors in the home and the neighborhood. The difference in customs and behavior and the perception of outsiders as threats can lead to conflicts, so the work of mediators and cultural adaptation specialists will be required. The problems of xenophobia and complicated relationships between dissimilar people are increasingly highlighted in popular culture. For example, in the fourth part of "Men in Black" or "The 100" series.

And finally, the attitude of society towards people with disabilities is changing. Information technologies allow them to fully integrate into a social activity. For example, visually impaired and blind people can work and communicate on the network using special programs and displays in Braille, and people with reduced mobility can imagine themselves as dancers using virtual glasses, Oculus Rift. In addition, in cities, an accessible environment is created for people with disabilities, including ramps, comfortable doors, and elevators, sensors and signals for the visually impaired, etc.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

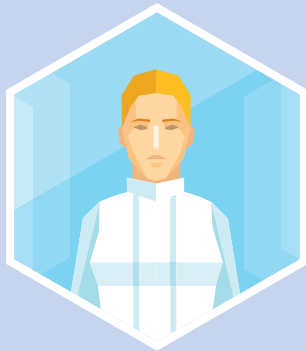Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

ECO-GUIDE

A specialist who supports initiative community groups working to improve the environment, provides information exchange between them, helps to organize public control of production and monitoring of people's behavior on the ground (in cities or villages). Many people are ready to participate in environmental activism, but they often lack an organizer who would say where and what to do. Some eco-activists are already gathering groups of volunteers around themselves, but in the future, even more specialists in this profile will be needed.

CROSS-PROFESSIONAL SKILLS

SOCIAL CONFLICT MEDIATOR

A specialist who helps to non-violently resolve conflicts that arise between social groups on the property, cultural, national, religious, and other grounds.

CROSS-PROFESSIONAL SKILLS
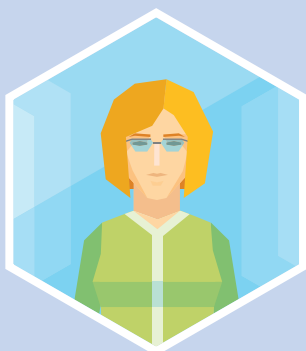
SPECIALIST IN THE ORGANIZATION OF PUBLIC-PRIVATE PARTNERSHIPS IN THE SOCIAL SPHERE

This specialist helps to transfer state functions in the social sphere (for example, cleaning of premises and territories, water and heat supply, energy-saving, recycling of solid household waste, repair of buildings and communications, municipal transport, kindergartens, etc.) under the responsibility of social entrepreneurs who organize these functions in the format of public-private partnerships.

CROSS-PROFESSIONAL SKILLS

PLATFORM MODERATOR FOR PERSONAL CHARITY PROGRAMS

He or she creates dossiers of personal requests for help (for example, children with cancer, or single pensioners) and provides a link between those in need and benefactors who provide assistance in various forms (money, in-kind contributions, spending time together, etc.). For example, the "Nuzhna Pomosh" ("Looking for Help") fund launched the media platform "Takie dela" ("There You Go"), where you can read stories about people who need help and immediately transfer money.

CROSS-PROFESSIONAL SKILLS

MIGRANT ADAPTATION SPECIALIST

A professional who teaches national language and culture, including through online platforms. Russian schools for migrants, including for children at regular schools, are already opening in Moscow and St. Petersburg. Since 2014, the School of Educational Training of Migrants has been working at RUDN University, where you can prepare and take tests in Russian as a foreign language, the history of Russia, and the fundamentals of Russian legislation[*]

CROSS-PROFESSIONAL SKILLS

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[*] Passing these tests is necessary to obtain citizenship of the Russian Federation.
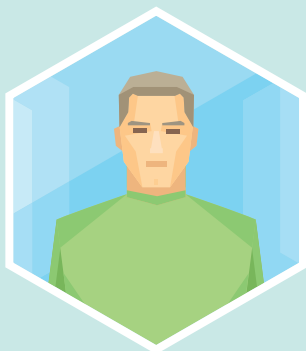
COMMUNITY CROWDSOURCING SPECIALIST

A professional who manages a crowdsourcing platform to collect information on problems of families, houses, districts, roads, parks, and other public spaces, sends requests to state organizations or NGOs and monitors their solution. An example of such platforms in Russia is the Democrat and Virtual Market sites.

CROSS-PROFESSIONAL SKILLS

SOCIAL WORKER ON ADAPTATION OF PEOPLE WITH DISABILITIES VIA THE INTERNET

A specialist who helps people with disabilities lead a full life, namely, teaches skills in remote work, assisting to choose the field of professional activity, organize the work process and the rest (for example, the selection of online communities, communication platforms, educational courses, etc.).

CROSS-PROFESSIONAL SKILLS
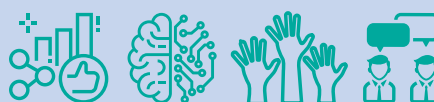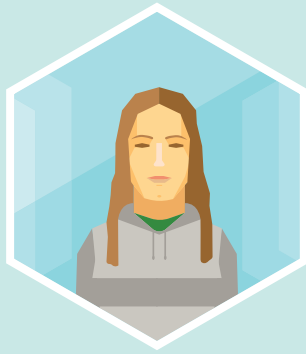
PLATFORM MODERATOR FOR COMMUNICATION WITH GOVERNMENT AGENCIES

A specialist who organizes online and offline dialogue between public activists and officials responsible for specific areas (for example, education, housing and communal services, construction, pensions, etc.), to develop joint solutions.

CROSS-PROFESSIONAL SKILLS
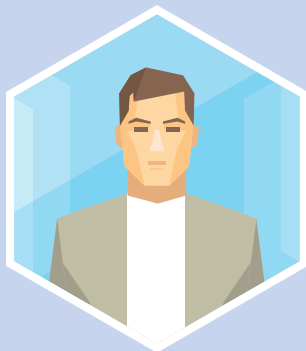
CORPORATE SOCIAL RESPONSIBILITY CONSULTANT

Modern companies seek a balance between profit and ethical behavior, even more so as consumers increasingly vote with their money for the products of companies that respect the principles of equality, with humane working conditions and environmental certification. Therefore, there is a growing demand for consultants who help balance these aspects.

CROSS-PROFESSIONAL SKILLS

CRISIS CENTER MANAGER

A manager who coordinates the work of various specialists in a crisis center. As humanistic values spread in society, more and more crisis centers appear to help vulnerable groups, especially women and children. Usually, social workers, psychologists, and lawyers work there together, combining psychological support with the help in solving the most pressing everyday problems.

CROSS-PROFESSIONAL SKILLS

ASSISTANT TECHNOLOGY IMPLEMENTATION SPECIALIST

Modern assistive technologies (wheelchairs, hearing aids, etc.) allow people with disabilities to lead an active lifestyle. But the problem is that there are not enough qualified specialists who can correctly prescribe assistive devices, configure them, and train patients to use them. Incorrect use can lead to injuries (for example, if people with back injuries are put in wheelchairs without special pillows to relieve pressure).

CROSS-PROFESSIONAL SKILLS

DEVELOPER OF SHARING PLATFORMS

A specialist who creates online platforms and mobile applications that help people share unnecessary things, food, and share services.

CROSS-PROFESSIONAL SKILLS

MODERATOR OF SHARING PLATFORMS

A specialist who supervises a platform for exchanging things, food and services, tracking inappropriate behavior, recalling the rules of exchange, and improving the system in accordance with the wishes of users.

CROSS-PROFESSIONAL SKILLS

VOLUNTEER GROUP CURATOR

A specialist who recruits volunteers for any kind of social activity, forms groups out of them, and monitors well-coordinated work in the team, recalling tasks and talking about the most productive ways to accomplish them.

CROSS-PROFESSIONAL SKILLS
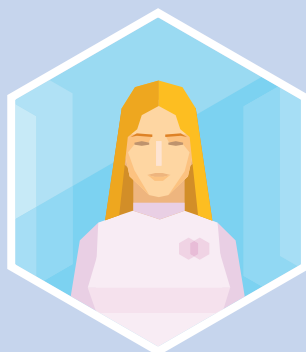
PERSONAL ETHICAL CONSUMPTION ADVISOR

A specialist who will help you figure out which products and services to buy ethically, and which are better to refuse. Ethical standards regarding how, where, and by whom goods and services are produced are gradually changing: now users can refuse to buy goods whose production is harmful to nature or violates labor laws. For example, in 2017, there was a scandal when it turned out that the cosmetics company Natura Siberica cosmetics company used an extract of non-ossified reindeer horns, the extraction of which is painful for animals.

CROSS-PROFESSIONAL SKILLS
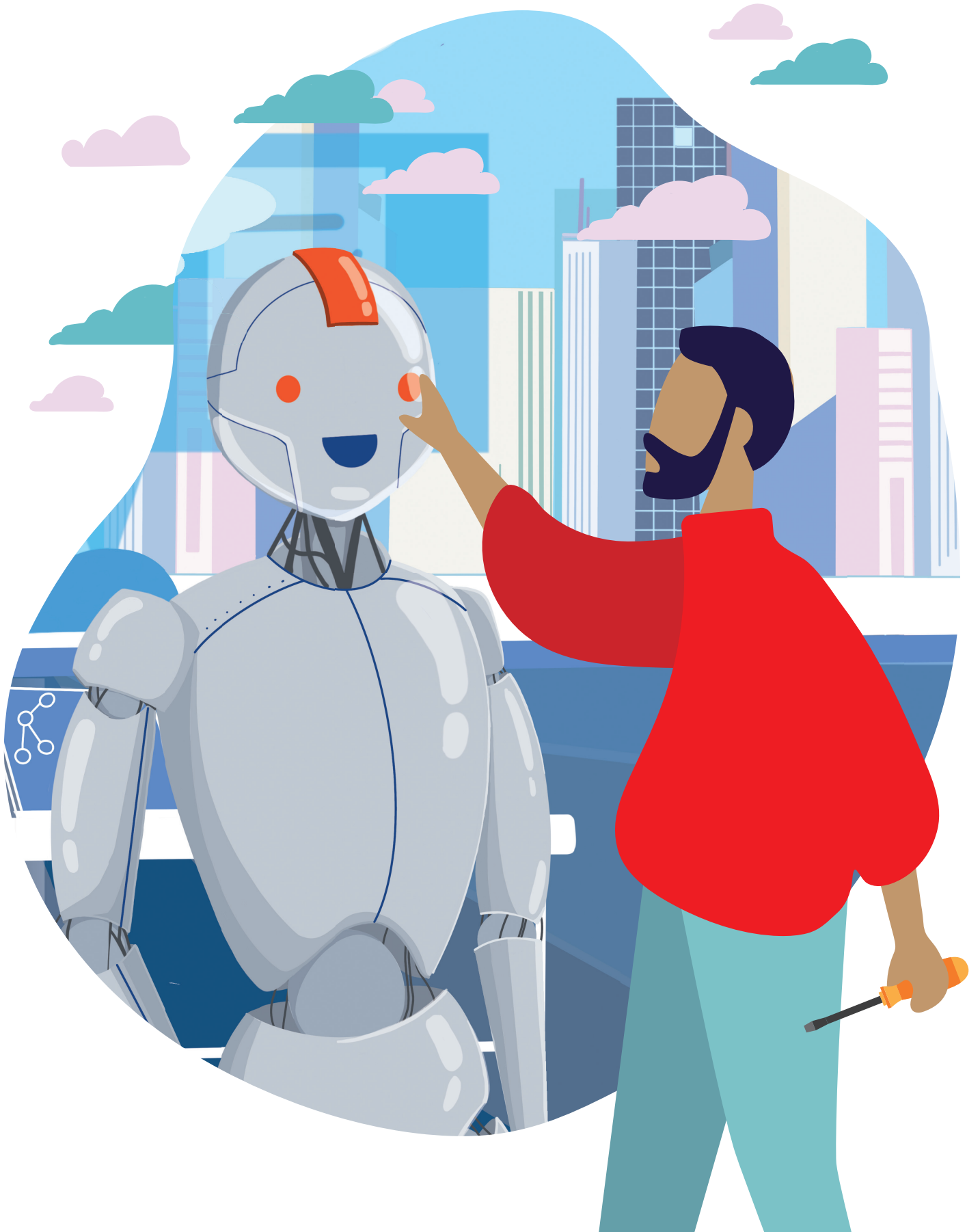
ROBOTICS

Nika flopped into a pink soft something. Entangled in the abundance of plush paws, she scrambled out of their arms with difficulty and smiled involuntarily, looking around the office. She has seen a lot, but this... Nika seemed to be in a company in which the children worked. The walls were painted in delicate pastel colors. There were giant soft toys in the corners and Lego constructors on the round table for meetings. Posters with the characters of comic books were hanging on the walls.

On a widescreen, a robot model with a cute cartoonish face was spinning in front.

"Arina," a pleasant female voice was heard from the speakers. "A personal robot nanny designed to help parents working at home. While you are involved in important projects, Arina will take care of your children."

A nursery appeared on the screen. The robot held out to the boy about four years old a glass of water and vitamins.

"Arina will monitor the safety of children, warm up food, show cartoons, and answer the most intricate questions."

"Why is the grass green?" asked the boy on the screen.

"There is such a substance in plants, chlorophyll," the robot replied. "It absorbs all the colors of the solar spectrum and reflects green."

"I want my mom and dad to come to play too!"

"First, they need to finish work — this is such an important and responsible matter. Like yours, wich is to collect toys and brush your teeth. Let me play with you?"

The robot drove up to the basket and pulled out a dinosaur.

"Rrr-a-a-r!" The robot growled. "My name is Diplodocus. I'm a huge dinosaur! I can reach the roof of a three-story building!"

The child laughed. The screen went blank, and the robot model reappeared.

"Arina is equipped with smoke and gas sensors," the voice said. "Measures indoor temperature and oxygen level. At any suspicion of danger, she sends a signal to parents and, if necessary, to the rescue services. Arina will not let the child get bored. In her memory, there are more than a hundred outdoor games …"

The screen turned off, this time completely. Nika turned to understand what had happened and saw a gloomy guy of about twenty.

"Enough of this garbage for us," he muttered, sitting down at the common table. He nodded to Nika and shouted somewhere behind him, "Guys, the general meeting!"

The rest pulled themselves into the study — as young as the gloomy, as if yesterday schoolchildren.

"So," said the gloomy one, when everyone sat around the table, "the situation with Arina 1.0 is the following … Iwacom is ready to wait six months, but by then, we should have a new working Arina 2.0. Without the bugs and mess of Arina 1.0."

"Six months?" shrugged a girl with short curly hair. "We will succeed; we don't have a choice. Not everything is terrible there."

"Not terrible? Not terrible?!" The man frowned and hit his finger on his cell. "Here, you have the results of a limited launch."

The screen flashed. The new videos were clearly filmed by amateurs in different apartments and different rooms. There was only one thing left: poor Arina had a hard time. Children painted its body with paints, taped the screen with tape, splashed water guns at the robot, and threw toy blocks at it, kicked it. It was painful for Nika to watch a helpless, crumpled robot trying to pacify the children.

"Cool!" the long-haired guy with an earring in his nose exclaimed in the descending silence. "We'll add music, and it will become viral."

"It's not worth the virus," said the gloomy one. He sighed wearily. "Guys, we do not have millions for testing, as in large companies. We cannot make a bunch of bad products before something hits the jackpot. If Arina does not blow up the market, we will have to get back to full-time jobs."

"Turn off catastrophic thinking," the girl in glasses smiled. "Let's do it better so that it doesn't come to that. What do we need to change?"

The gloomy one grunted something under his breath but nodded.

"To start, let's talk in general. I'm Thaddeus Kychakov, a designer of home robots," he said to Nika. "And I was responsible for the robot doing two blocks of things. The first is household matters. Give a vitamin or medicine, monitor the safety of the child and the environment, carry heavyweight objects. The second, interact with a smart home: turn on the TV, order food based on the data from the refrigerator, all that."

"But something went wrong …" her curly whispered in a tragic voice.

"What?" asked Nika.

Thaddeus sighed heavily.

"You see … we are used to making assistant robots. What is their task? Execute commands. But we did not think that the requests of children could be … unreasonable. They made a robot, as usual: they ask for food, he gives it. But one child felt sick from overeating, and the other had a tradition — they had dinner with the whole family. As a result, there was a scandal, because before that the child had eaten too many sweets. So, in the new version, it is necessary to put the option of food restrictions. And not only in calories, macronutrients, and allergies, but also more specific."

"Right now, I'll tell you something cooler," wedged the curly, even before her colleague stopped talking. "I am an ergonomic designer. I make sure that using Arina is convenient and safe. And it seems I'm doing quite well, but I underestimated the entrepreneurial approach of the children," the curly grunted. "Firstly, these angels got into the habit of closing or even patching the camera. If the robot does not see, it means that you can create anything you want. He himself, poor thing, cannot get rid of scotch tape. So, Arina 2.0 should send an alarm to parents in this case. Let them save Arina and deal with their offspring. Secondly, the robot will have to be absolutely leak-proof."

"He is already with a waterproof case." the girl in glasses was surprised. "You're not going to send him to the pool."

"I say," the curly grinned, "do not underestimate the ingenuity of the children. Even without a pool, they manage to splash water all over the robot so that it shuts down."

The long-haired giggled, and Thaddeus cast an angry glance at him.

"Yes, I am nothing." the long-haired man was immediately embarrassed. "For my part, there are problems too. In the sense of children's robotics. What do we need for the robot to develop the child? Played with it, solved puzzles, did exercises, or taught it to dance. Answered questions … And now, with the latter, we have a problem."

"Are answers too smart?" smiled Nika.

"If …" the long-haired sighed. "When we conducted the tests, 90% of parents were in favor of the robot possessing the most extensive knowledge. But then they were indignant when Arina began to talk in detail about some issues …" He hesitated.

"What issues?" Thaddeus muttered.

"Whatever," said the long-haired. "Where the children come from, what else!"

This time the curly giggled.

"In my opinion, we have not a serious company here, but a kindergarten!" Thaddeus was indignant.

"The man said, looking at the teddy bear," curly commented softly. And she said louder, "Well, here it is clear: we introduce restrictions. We will make several levels of access to information so that parents can choose."

"And you also need to add training for children with special needs: sedentary, low intensity, without jumping."

"Well!" the curly clapped her hands, "have you sorted out the main one?"

"Not really." the second girl corrected her glasses. "While we were watching materials on Arina 1.0, we noticed an unpleasant tendency."

"Where else did Arina screw up?" the long-haired sighed.

"Not Arina. Children. Some of them begin to mock robots. Push, kick, call names."

"So what?" shrugged curly. "This is a robot."

"Only from a formal point of view," the girl in glasses shook her head. "I am a consultant on roboethics, and Alexander," she looked at the gloomy one, "specially invited me to the team. Because the child perceives the robot not just as a tool, but as a significant adult. Arina talks to him, plays, feeds him, teaches, encourages him. She is not just a robot. And the way a child handles a robot affects his attitude towards people."

"We must add a reaction to the actions of the child," Thaddeus said. "If the robot notices violent behavior, it must show the child that this should not be done, and explain why."

"I thought it was the parents' task to raise their children," snorted the curly.

"Of course." the roboethics consultant nodded. "First of all, parents should do this. We are not going to replace them. But such feedback is important for the child."

"And what, Arina will punish them? Even beat?" frowned Nika.

"To beat?!" the girl in glasses was horrified. "Of course not! Physical punishment leads to the low self-esteem of the child, increased anxiety. Children grow up with a distrust to the world, do not know how to defend their borders, and get used to resolving conflicts with aggression. No, Arina will explain how other creatures react to the actions of the child, to instill empathy in him."

"It is important that the robot uses correct phrases and actions that are clear to children," Thaddeus said to the long-haired.

"Of course," he nodded. "We will teach children empathy. A sad expression will begin to appear on Arina's face; she will groan or even cry out in pain. And every time a child behaves rudely or cruelly, she will interrupt these actions and explain why this should not be done."

"Fine." Thaddeus leaned back in his chair and held out, "Water resistance, reaction to blindness and aggression … Add this … and there is a chance that the children will not kill our robot."

"Oh no," the long-haired grinned. "Children can do anything, I'm saying it as an expert."

While the others were gathering, Nika looked at the screen. Arina continued to spin, stammer, and get kicks from the children. The girl started and turned away. How much aggression is in them!

"Aren't you afraid that robots will one day rise and kick people?" She asked, frowning and uncomfortably cringed at her own words.

"And that's why I switched to children's robots," Thaddeus grinned. "I hope to raise a generation of people who do not want to kick."

Nika looked through the glass door, behind which the roborabbit was waiting for her, and promised herself that she would not scold it anymore unless it moves her to the top of a pine tree or the mouth of a volcano.

TASK

Come up with similar stories based on the following case study, vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might look like the room where the characters work?

- What conflicts and surprises may arise during the course of work be like?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. You need to develop and program medical nanorobots[*] that circulate through the blood vessels and clean them of cholesterol plaques[**], and also make sure that the production and use of these robots are safe (hint: you can also refer to the specialists from the chapter "New materials and nanotechnology").

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[*]   Tiny robots, size of a molecule.

[**]   Accumulation of cholesterol, calcium and other substances on the walls of arteries that leads to dangerous cardiovascular diseases.

VISION OF THE FUTURE

Ideas that, for a long time, seemed like science fiction, can come true in the near future. Robot manufacturing technologies have cheapened, and this has sparked a new surge of interest in smart machines. According to a Cisco study, the number of home robots in cities doubles every 9 months. In the 2030s, robots will become a usual part of the interior of an apartment and urban spaces. Today there are robots that can look after seniors (provide medicine, contact a doctor, send an SMS to an ambulance if a person suddenly falls), help with cooking, clean up pets and even serve beer from the refrigerator to the owner.

Furniture and household appliances are getting smarter too. In addition to a quite popular robotic vacuum cleaner, smart tables, mobile wardrobes, and robotic baby strollers are created. For example, Ori Living, a company that creates robotic furniture systems (you can turn a bed into a workplace with a slight movement of the hand, etc.), raised $20 million from a pool of investors including IKEA). And it is very likely that the production of home robots will become one of the fastest-growing industries.

Robots will move from closed specialized premises (for example, enterprises) to freedom — first of all, on city streets. This means that we will have to create an infrastructure with wireless networks, charging stations, markings, and identifiers, which would be convenient for robots to navigate.

With the development of biotechnology and medicine, we are beginning to understand better how our bodies and psyche work. These data will help make robots more convenient, ergonomic, and psychologically comfortable for humans. Neural interfaces are being developed that will allow robots to be controlled by the power of thought. For example, researchers at the Massachusetts Institute of Technology and Boston University have developed a neural interface that uses ErrP — the weak electrical signals that the brain generates when a person sees an error. Using this interface, the user can

send an alert every time he sees that the robot is doing something wrong.

In order for robots to perform complex actions, they do not have to be complexly designed and programmed. You can take many very simple robots and program them so that they act as a swarm of bees or a colony of ants: each individual obeys just a few simple rules, but together they can exhibit complex behavior. Such robots are called "smarticles" (composed of "smart" + "particle"). Work on smart swarm algorithms is underway at Harvard, Georgettech, Colorado, and other universities. In the future, the self-organization of robots can be used, for example, to explore new territories and work in outer space.

Robots will play an important role in medicine — surgical machines are being developed to help carry out complex operations, and cyber prostheses will allow people with disabilities to live a full and eventful life. Robotics also helps with the solution of simpler and similar tasks, such as registering patients and working with electronic cards. There are also special machines for transporting drugs (for example, Hospi from Panasonic) and an Omnicell M5000 machine, which packs up sets of tablets for patients, according to the doctor's prescription. Programmable nanorobots[*] will examine the organs from the inside and deliver the drugs to the right parts of the body. For example, there is the South Korean project Bacteriorobot, where nanorobots live in modified cells of Salmonella bacteria and can identify cancer cells and deliver drugs to them without affecting healthy tissue. Robots are also used as dummies for practicing medical skills — there are even simulations of women in labor and babies.

Such an abundance of robots in the modern world and even bolder prospects for their application raise questions about ethics. Back in 1942, science fiction writer Isaac Asimov formulated three laws of robotics, which are still being comprehended by the scientific community. There are many aspects of roboethics. Can a person harm a robot for fun? If the

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[*]   Tiny robots comparable in size to a molecule.

robot creates another robot, who gets the copyright — the creator of the first robot or the first robot itself? If a robot injures a person, who should be responsible — the robot itself, the owner, designer, or the software developer? How do we program the robot to make fair moral decisions, and what should they be? Attempts to come up with a universal legislative code on roboethics are already underway. In 2017, the European Parliament adopted the resolution Civil Laws on Robotics and the Charter on Robotics, but moral standards in societies vary greatly, depending on national and cultural traditions. So, perhaps, users will have to reconfigure their robots, moving from country to country.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT
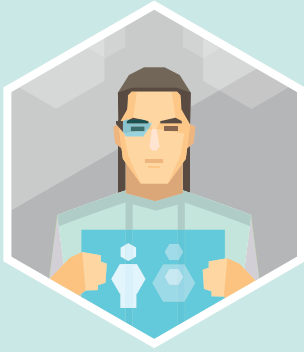
HOME ROBOT DESIGNER

A specialist who develops and programs home robots to help with the household (for example, a nurse robot, a robot cleaner, a laundress robot, a gardener robot, a dog-walking robot, etc.). Such robots are integrated with other elements of a smart home, have freedom of movement, and can perform complex household duties.

CROSS-PROFESSIONAL SKILLS
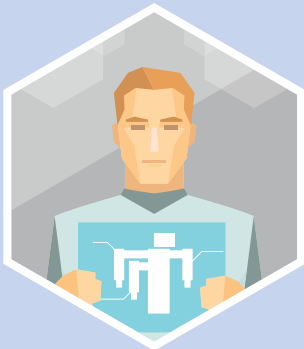
MEDICAL ROBOT DESIGNER

A specialist in the design of biocompatible robotic systems and cyber devices for medicine and the biotechnology industry (for example, surgical robots, diagnostic robots, cyber prostheses, etc.).

CROSS-PROFESSIONAL SKILLS

ROBOT CONTROL NEURAL INTERFACE DESIGNER

A specialist who designs control systems for operating industrial robots through neural interfaces that allow controlling the process, both for individual operators and distributed teams.

CROSS-PROFESSIONAL SKILLS

CHILDREN'S ROBOTICS DESIGNER

A specialist who develops children's toys, games, gadgets, and various mechanized consumer goods based on programmable robots and takes into account the psychophysiological characteristics of childhood. For example, Japanese scientists have developed the Keepon social robot specifically for interacting with children with autism. He or she teaches children to communicate and recognize other people's emotions. And the Shelly, a turtle robot, created at Naver Labs, teaches children sensitivity and humanism. It is programmed to show stressful reactions to abuse.

CROSS-PROFESSIONAL SKILLS

COMPOSITES ENGINEER

A specialist in the selection of composite materials for the production of parts, mechanisms, connecting elements of robotic devices with specified characteristics, including using 3D printing.

CROSS-PROFESSIONAL SKILLS

ERGONOMIC DESIGNER

A specialist who designs robotic systems, taking into account the ergonomic requirements of users, based on their physical and mental characteristics.

CROSS-PROFESSIONAL SKILLS
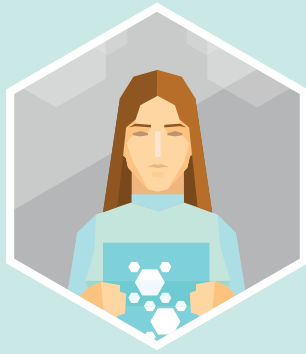
NANOBOT DEVELOPER

A professional who creates microscopic robots for medical and other purposes. Often, he or she joins forces with a smart swarm programmer.

CROSS-PROFESSIONAL SKILLS
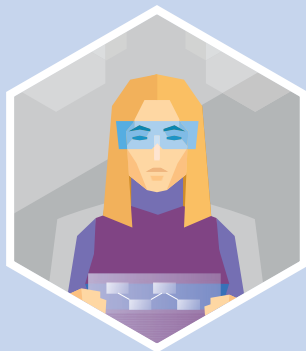
SMART SWARM PROGRAMMER

An IT specialist who develops algorithms for complex group interaction for robots, including drawing on examples from wildlife (in particular, the swarm intelligence of bees and ants).

CROSS-PROFESSIONAL SKILLS

ROBOETHICS CONSULTANT

A professional who develops ethical codes for both robots themselves and human behavior, regarding robots: he or she can also advise companies, scientists, and ordinary users on the topic of roboethics.

CROSS-PROFESSIONAL SKILLS

AVIATION

Nika let go of the roborabbit go and looked around. In front of her, there was a large and spacious hangar with a semicircular glass ceiling, through which daylight penetrated inside. On both sides of Nika, compact planes stood in even rows, not the ones you can see at airports, but small and elegant, real toys. Aircraft slowly rotated around its axis on automatic round platforms. "Just like at a car dealership," thought Nika. In fact, the room looked as if someone had stretched a regular car dealership up and four times wide, and instead of Chryslers and Ferrari, these gorgeous flying vehicles were put on demonstration platforms.

"Good afternoon," came a sonorous voice behind. Nika turned around. A tall, beautiful woman in high heels, in a business suit, cheerfully walked toward her. "You must be Nika. I am Valentina. Welcome!"

"Thank you, but … welcome, where?"

"Higher Design Bureau, of course." Valentina smiled dazzlingly. "We make private planes on order. I am the executive director."

"Who are the planes for?"

"For officials. Or, just the rich. Let's go."

Nika turned after Valentina and saw a group of young people sitting at a portable table with tablets.

"Meet Tamara, an aeronautics infrastructure designer." Valentina pointed to a girl nervously biting her thumb. "Ainur is a small aircraft production engineer," to a guy who was stubbornly drawing something on a piece of paper. "Kirill," load optimization engineer," a stooped man, time after time, throwing a jumper ball on the floor.

The specialists nodded and waved, greeting Nika. But it was easy for the girl to notice that they were not at all disposed to acquaintance and chatter. Something worried them all very well.

"You were very lucky." Valentina, on the contrary, remained cheerful and happy. Or at least, tried to seem. "We are just waiting for an important customer to discuss the project."

"Having such a customer is really a luck," Kirill put in with undisguised sarcasm, and the ball hit the floor with a knock.

"And what's wrong with him?" asked Nika.

"Moody as hell," Ainur muttered without looking up.

"Ainur!" Valentina besieged him. "Although, basically, he is right. The customer is really demanding."

Further down the aisle, an automatic alarm squeaked.

"Oh! Barbarians at the gate," Kirill remarked with the same sarcasm.

"Mom." Tamara sighed.

"So, everyone be quiet! Look politely and smile!" commanded Valentina.

The automatic hangar door buzzed as the visitor entered. The tension froze on the faces of the experts, as if they were preparing to repel an attack of armed bandits. Ainur, following Valentina's advice, tried to smile, but the smile came out somehow doomed. The steps of the one who entered echoed from the walls of the hangar, and Nika saw… a senior boy, hardly older than herself. He walked like a real slacker: hands in pockets, waddling gait, sneakers strike on the floor. Grated jeans, a T-shirt with a cartoon character, a one-eyed yellow triangle in a bow-tie and top hat.

"Hi, people!" the guy cheerfully greeted. "Well, how's my plane?"

"Come on," Valentina said and led the guy deep into the hangar. Nika followed them, but saw only empty space. But then, Valentina handed them both 3D glasses. Nika put them on and involuntarily gasped. A voluminous color model of an elegant single-seat aircraft hung over the floor, spinning.

"So, Will," Valentina began cheerfully, "you wanted sports piloting, so the shape of the device is streamlined. Any air currents will rip open the paper like a knife and—"

"Hello," the guy, not listening, especially to Valentina, grinned at Nika. He spoke with a subtle accent. "Golukhov. William Alexander. The IT god."

"Mm … Very nice," Nika said. She did not know how to communicate with the owners of private jets.

"Do you know what a running propeller has in common with a beautiful girl?"

"Um … No."

"If you stand too close, you can lose your head."

Nika barely suppressed her laugh. She tried to figure out what to answer, but Valentina saved her.

"Will, it's important for us to discuss the design project." she kept calm, but the woman's cheeks turned red. "We will equip the plane with an emergency motor, which we will arrange …"

"Why is it single-seated?" interrupted her boyfriend.

"Sorry?"

"You can't ride with girls in a single-seated cabin plane. Why do I need a plane without girls?"

"Well, Will, this is a simple matter." Valentina tapped her tablet, and the model of the plane began to transform before her eyes, turning from a single to a double-seated mode.

"No, no, no, I don't need a second cabin in the back! I'm not going to twist my head in flight to communicate with her! Make a second seat next to the pilot!"

"But it will have to change the size, increase the wingspan," Valentina said carefully.

"Let's do this: I will add another twenty percent of mark-up, and you will make the second seat!" Valentina exhaled and nodded.

"Ainur, while I am recalculating, tell Will about the material."

Ainur raised his eyes to Will and began to click on his tablet with one finger.

"To make the aircraft lighter and stronger, we will make the fuselage 50 percent of composite materials." Fragments of the model flashed with colorful lights. A window with data popped up next to each segment, which materials are included in this part of the aircraft that pressure and temperature can withstand. "Fuel, by the way, will also be advanced. Carbon-based, of course, but …"

"So, stop-stop-stop! What carbon?!" Will interrupted him. "I wanted an environmentally friendly transport!"

"You see, Will," Valentina said softly, "that would have raised the cost. We would like to first propose a budget option."

"Do I look like a "budget option?" He raised his eyebrows.

— No, of course not." Valentina hastened to assure him. She exchanged glances with the others.

"So," said Will, "can you do engines on solar panels?"

"We can," Valentina said quietly, "but such planes fly at a speed of up to 150 kilometers per hour."

Will thought for a moment.

"We can offer mixed fuel. Still fewer emissions," Ainur added.

"Sure, go for the mixed one. I am not a rascal. I understand the responsibility to the planet. By the way," Will's attention suddenly jumped on Tamara, who had to quickly remove a fingernail from her mouth, "after all, you are the one who designs the hangar, right?"

"Me," Tamara answered nervously and brought to a screen a three-dimensional mock-up of the future hangar with a runway."

"Great! Will there be a pool table?"

"Billiards?"

"And this … You know … Mocktail bar! Put it somewhere in a corner."

The girl nodded silently.

"In general, everything is good," Will said, examining the new model from all sides. "But I need a test."

"Right away." Valentina smiled and dialed someone's number on the tablet. A thick, low voice came from the speaker: "I'm listening."

"Will, this is Eugene, our specialist in digital modeling. Eugene, Kir, please arrange a test. I am sending the data."

"Well, let's get started," muttered Eugene from the speaker.

The three-dimensional model had changed again. The plane took off and flew around the perimeter of the hangar. It was circling promptly over the heads of the observers, and Nika involuntarily ducked as the self-driving plane sped straight over her.

"Kir," said a voice from the speaker. "Now, I will change the given conditions, read the load and failures in navigation. Are you ready?"

"Ummm," said Kirill.

"Strengthening the wind by twenty percent."

The model of the plane shook a little, as if it had collided with an invisible air stream. Kirill tapped his fingers on the tablet, fixing the load indicators.

"I'm modeling the cloud cover."

On the way of the plane, as if by magic, thick virtual clouds grew.

"Run the script with the rain."

"Forget it, let's have a thunderstorm right away," Kirill answered. "You used a program with rain in a thunderstorm?"

"Yes."

"So why waste time? we'll calculate everything right away."

Then Nika squealed and, not immediately realizing what she was doing, grabbed Will's shoulder. Right above them, thunderstruck, lightning flashed. Jets of ethereal digital rain cut the plane; it shook in the air.

"You have nothing to fear. I'm here," Will said, and put his arms around the girl.

"Umm, I'm not afraid. I'm just …" Nika embarrassedly moved away.

"Can we have a tornado?" Will suddenly asked.

There was a pause.

"What for?" surprised Eugene asked from the speaker.

"If the girl is beautiful, you never know where you can fly away."

Apparently, Eugene obeyed: a howl of wind came from the speakers, the plane spun and spun … and then the model slammed down, crashed into the floor at full speed. An unrealistic digital flame flashed, and the model evaporated.

"Oh." Tamara bit her nail again.

Will looked with childish amazement at the place on the floor where the model crashed.

"So, he won't be able to endure bad weather …" he said.

"Will, understand us correctly," Valentina began, "for overloads of this scale, a different type of transport is needed, and more time will be required …"

"Oh, okay!" with unexpectedly carefree waved the young millionaire. "You just, you know, put the weather indicator in the panel. I will check before the flight."

"So … I … are you … are you happy with the project?" Valentine asked with confusion.

"Well, yes, why. The double-seated and a hangar with a mocktail bar, — and we are good. Tell me," Will turned back to Nika. "Let's fly, uh … well … And what's your name, by the way?"

"Nika." the girl gave a smile: what a playboy, he forgot to ask the name!

"Nika. Exactly." Will rubbed his neck in embarrassment. "Well, so, let's fly?"

The girl felt something touch her knee. Roborabbit.

"Let's fly. But not on a plane. I don't need them." Nika couldn't help herself not to stab Will. It was worth it: the eyes of a young playboy rounded at the sight of the robot.

"Wow! Is that a pleasure craft? Do you ride it?"

"Yeah. In space and time." Nika grabbed the ears of the roborabbit.

Already flying off into the distance, she heard how Will muttered under his breath:

"Exactly. I need a scooter drone."

TASK

Come up with similar stories based on the following case study, vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the room where the characters work be like?

- What conflicts and surprises may arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. You need to design an airship to deliver goods to remote areas of Eastern Siberia: to build its digital model, calculate the optimal weight and load capacity, and also build an airfield for it.

VISION OF THE FUTURE

An aircraft allows people to quickly travel huge distances and get into areas inaccessible to land transport, which is important for a huge country like Russia. Russia has traditionally been one of the leaders in the field of aircraft construction and the use of air transport, but over time, it has lost these positions. However, the industry has recently begun to recover, including small aviation systems, regional airports, etc. Significant technological breakthroughs are expected in this area, and it will play an increasingly important role in the future. Air transport will become more accessible and diverse — small civil aviation is already actively developing, and in the next 10–15 years, aircraft may appear that are comparable in price to a car.

It is expected that by 2050, the number of civil aviation flights will double, which increases the burden on the environment (aviation is one of the main sources of anthropogenic, i.e., human-caused air pollution). Therefore, technologies are being developed that will make the design of the aircraft and on-board equipment easier and more convenient, which will allow you to spend less fuel on flights.

In order for the aircraft to consume less fuel, it is also possible to optimize flight dynamics and distribute the maximum take-off mass[*]. These tasks can be solved with the new design of the wings, the shape of which is adapted to flight speed. FlexSys Inc is commissioned by NASA to develop transformable flap technology. It has already been successfully tested on a Gulfstream III aircraft.

In addition, on-board systems can be made more compact and easier-to-use. For example, completely or partially replace hydraulic systems with electric ones. At the same time, on-board electrical equipment should work well in bad weather without accumulating static electricity on the fuselage.

The use of composite materials[**] can reduce weight and increase the strength of the apparatus. For example, the Boeing 787 Dreamliner is already half made of composite materials. Composites with high heat resistance can be used to create parts in engines, while the ones with sensor elements will help to detect damaged parts in time, which will reduce the cost of diagnostics and repairment and reduce the risk of accidents.

The options for transferring aircraft to biofuels are being considered. In 2016, the successful tests of the American military aircraft EA-18G Growler, which first flew on one hundred percent biofuel, were successful. And in the winter of 2018, the Boeing 787 Dreamliner airliner, which used a hybrid mixture of kerosene and biofuels, made the first commercial flight from Abu Dhabi to Amsterdam.

Ballooning, which, it would seem, was condemned to oblivion in the 1930s, will also revive — airships will appear on a new technological basis. They will be used in hard-to-reach areas (for example, to extinguish forest fires or deliver goods). In addition, the airship requires much less fuel and is less harmful to the environment.

In 2016, Lockheed Martin Corp. signed a contract worth $500 million for a dozen hybrid-electric airships LMH-1 (the beginning of operation in 2020–2021) for the delivery of goods in the Arctic. Chinese airline CAIGA recently announced plans to build an assembly line for airships. Mass production should start in 2022. The growth of "sky traffic" will require new, more developed supervisory control systems. This will set new requirements for infrastructure construction and intelligent dispatcher support systems.

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[*]　The maximum mass of the aircraft at which it can take off in compliance with all safety rules.

[**]　Inhomogeneous materials consisting of several components. Such a mixture allows the material to give new useful combinations of properties.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

AERONAUTICS INFRASTRUCTURE DESIGNER

A specialist who designs airfields, hangars, service stations, and navigation infrastructure elements for airships. Airships will be able to deliver goods to places that are difficult to access due to poor transport infrastructure.

CROSS-PROFESSIONAL SKILLS

AIRCRAFT RECYCLING TECHNOLOGIST

A specialist developing recycling schemes for materials, raw materials, equipment, and frame elements of aircraft. This profession already exists, and there is an international Aircraft Fleet Recycling Association, which includes large manufacturers (such as Boeing, Bombardier), engine manufacturers, such as Pratt.

CROSS-PROFESSIONAL SKILLS

UNMANNED AIRCRAFT INTERFACE DESIGNER

A specialist in the development of interfaces and programs for controlling unmanned aerial vehicles, is responsible for programming and operating navigation and safety systems for unmanned aerial vehicles.

CROSS-PROFESSIONAL SKILLS

AIRSHIP DESIGNER

A specialist who develops models of airships, considering the purpose of their use (freight or passenger) and aeronautical conditions.

CROSS-PROFESSIONAL SKILLS

PERFORMANCE ANALYST

A specialist who processes data and prepares expert opinions that permit or prohibit flights. To do this, he analyzes the condition of the aircraft, the runway.

CROSS-PROFESSIONAL SKILLS

SMALL AVIATION PRODUCTION ENGINEER

This specialist designs and models low-cost aircraft of varying complexity for small civil aviation. There are already such engineers, but with the development of small aircraft (which is important for expanding the transport infrastructure in our country), more will be needed.

CROSS-PROFESSIONAL SKILLS

REPAIRMAN-COMPOSER

A repairman who specializes in aircraft parts made from composite materials. Due to the complex composition of composites, the repair of such elements is laborious and has its own nuances.

CROSS-PROFESSIONAL SKILLS

DIGITAL MODELING SPECIALIST

A professional designing a digital model of the future aircraft, which, like BIM in construction, allows you to consider production in various aspects: materials, mechanics, electrification, engines, environmental friendliness, design, etc.

CROSS-PROFESSIONAL SKILLS

LOAD OPTIMIZATION ENGINEER

A specialist optimizing aircraft weight. He selects lighter materials, develops a more compact electrified on-board equipment (in comparison with bulkier and more difficult to operate hydraulics) in order to reduce the weight of the aircraft and, accordingly, reduce fuel consumption.

CROSS-PROFESSIONAL SKILLS

INTELLIGENT DISPATCH SYSTEM DEVELOPER*

A professional who develops software solutions for controlling traffic in the airspace of cities and regions with heavy traffic (so that helicopters, private planes, and drones do not collide with each other).

CROSS-PROFESSIONAL SKILLS

* In the previous version of the Atlas of emerging jobs, this profession was called "the developer of intelligent dispatch control systems."

DRONE ADJUSTER

Drones will appear almost everywhere. They will begin to be widely used as taxis, couriers, to assess traffic, even to deliver organs to hospitals. It will take specialists who can ensure the safety of the movement of drones in the city.

CROSS-PROFESSIONAL SKILLS

WATER TRANSPORT

The robotic rabbit gently lowered Nika to the floor.

"What, no adventures for today?" the girl grinned, looking at the plain office walls. She turned around and froze.

Nimble fish snaked between corals right in front of her, at arm's length, swayed from the underwater currents of the algae. Nika looked for the end of this giant aquarium until she realized that it wasn't a fish swimming inside the building; but the building was inside their abode, who knows what depth.

The girl stuck her nose to the thick glass and looked with all her eyes. A jamb of brilliant fish swam past. Two of them separated and headed straight to the base. Only when they got close Nika noticed strange black camera eyes and even too neatly fitted scales — the fish was not real.

A hatch opened in the womb of the base, and a robotic fish swam inside.

"Siinäkös sinä olet!" came a ringing voice behind Nika. A fair-haired, tall woman ran towards her. She chattered something into the microphone on the go, but Nika did not understand a word.

"Mennään!" caught up with Nika, the blonde made a gesture with her hand, offering to follow her. Nika hurried after a stranger who did not stop talking.

Soon, they were in the room, looking like the control room in movies. On dozens of screens, data continuously changed, maps shone, and radar data was updated.

The fair-haired girl held out a headphone to Nika and headed for the people sitting in front of the computers. Once Nika put on the device, the woman's speech split. She still spoke incomprehensibly, but a virtually simultaneous translation sounded in her earpiece.

"Five minutes ago, fishes-21 spotted coelacanth," the fair-haired woman said restlessly. "But something went wrong. I cannot contact them."

"What are coelacanths?" Nika heard this name for the first time.

"Ancient fish, Latimeria chalumnae. Rare and valuable. It would be good luck if four to five individuals were spotted per year. And here is a whole shoal of them. But once we rejoiced, the robots disappeared."

"Let's figure it out." A shaggy man sighed and tapped on the keys.

"What are you doing?" Nika got interested.

"Don't distract him," the fair-haired lady yelled at her. "He is a cybertech engaged in the Internet of things here, in the depths. And he must ensure that all robots have access points!" the last, she spoke louder than necessary, obviously not addressing Nika.

"I see. The signal disappeared six minutes ago. How far were they? Maybe they sailed away."

"Do you think I'm an idiot? They have a limit; they will not float further than necessary. They should have sent a file; can you open it? We need to know whether the coelacanths took our fishes for their relatives."

"How can it be possible?" Nika got inquisitive.

"Sure, it can! Robots look like fish, imitate their behavior, and do not cause concern. And this allows you to do something that has never been possible before: to observe the coelacanth in their natural environment."

"But what about recharging?"

"The robots have an in-built circulating energy system, something like a synthetic circulatory system." It makes them light and mobile, and robots can do without charging for several days.

"But how does electricity get here?" Nika did not understand. "We are not even near the shore!"

"The base is powered by a power station. It receives energy through the ebbs and flows. Do you know how windmills work? The wind is blowing, and the mechanisms are spinning. So, here it is — the power of the tides turns into energy. The only difference is that here we have better prognoses.

"I downloaded the data from the fish," the cyber technician said. "The files were damaged, but I managed to restore something. Check this out."

He pressed the button, and several windows appeared on the monitor screen at once. The blonde woman clicked on the thumbnail of the video, and the schools of large blunt-headed fish appeared on the screen. Nika hardly found robots among them; they behaved like their living brothers.

"The coelacanths admitted them," the blond-haired woman blurred in a smile. Her face smoothed, and already without haste, she opened the remaining files. She ran their eyes, nodding to herself, and suddenly froze.

"What is there?"

"A shark," the woman said. "Robots spotted a shark in a couple of kilometers. If it does not change the trajectory, it will sail straight to them."

"So what?" asked Nika, although she already understood that meant nothing good.

"It will simply gobble up coelacanths and smash robots! When will it reach them?" The blonde asked the cyber technician.

"With the same course and speed, it will take twenty minutes."

"Maybe the shark will change the course," Nika tried to console.

"And if not? You can't take such a risk! There's about 300 Latimeria chalumnae. To find them for the second time will take months! Years!"

"Do you want me to send a drone to them?" a woman sitting nearby with her hedgehog responded. "Charlie 13 can reach them in ten minutes. We can scare the shark!"

"Can you control them?" Nika was surprised.

"Of course," the woman snorted. "Unmanned vehicle controllers are then needed." Suddenly, the task can change, or something goes wrong. So what? Launch?"

"The coelacanths will also be scared and will flee." The blond-haired woman shook her head. "And we found them with such difficulty. It is necessary to reconnect with the robots first, then the drone." She pushed aside cyber technician and tapped her fingers on the keyboard.

"Did you come up with something?"

"We will contact the designer of these fish," the blond-haired woman said through gritted teeth and smiled at the gray-haired man who appeared on the screen. "Good evening, Frank. An urgent question. Lost contact with your fish. We checked everything, and there were no errors. What is the reason?"

"At what distance were they then?'

"On normal. The maximum, but acceptable."

"I thought so," the gray-haired man grimaced. "Damn marketers! The maximum allowable is if there are no barriers: algae, reefs … And so … You understand…"

The fair-haired swore quietly and asked:

"So, what can we do?"

"Can you send someone after?"

"Why?"

"Give him a router, and the robots will catch the signal. There are no other options."

"Will we succeed?" the fair-haired turned to the cyber technician. He sighed and rushed out of the control room. The woman with Nika were behind him.

They had to act quickly. The cyber technician hastily checked the robot: this time, it was almost like a crab with convenient claws-manipulators. He put a wireless router in one of the pincers, tied it with thin cables for reliability.

"And if it drops it?" The blonde asked as they watched through the monitors as the crab moved briskly away from the base.

"He will not," the cyber technician snapped, watching the ward in all eyes.

"Ten minutes," said the dispatcher. "Should I send Charlie?"

The fair-haired nodded. She looked only at these fish — there was still no connection with them. A minute passed, then another one. Now, it seemed to Nika that the crab was moving too slowly.

"Can it move faster?" She could not stand it.

"Then it will drop the router," the cyber technician shook his head.

"The fish should have already caught the signal, weren't they?"

She looked around at the silent adults. Their faces were gloomy.

Five minutes left before the arrival of the shark. Robots simply do not have time to take away the coelacanth!

"There it is!" Shouted the blonde. Her fingers fluttered over the keyboard, and she gave commands to the fish. The screens flashed, and through the cameras of the robots, she saw the serenely floating coelacanths.

Suddenly, one of the robots set in motion and began to drive fish from the coral reefs. Another fired a net, and it entangled fishes and the robot shooter dragged the net away from the shark.

"Come on, baby," the fair-haired whispered. "Get out!"

"Shark!" screamed Nika, but at the same moment, a drone flew in front of the blunt nose of the fish. The shark dodged, pulled its face, and swam to the left, away from the lurking robots.

"Got it!" the dispatcher threw up his hand. The fair-haired shone with happiness.

The fish-robot transferred the coelacanth to a new place and freed from the net. According to the collected data, there was plenty of food there, and sharks almost never appeared at the place.

"Phew," Nika said nervously. It was not possible to get rid of the remnants of anxiety for fish. "I thought you were just sitting and watching."

"A world is a difficult place," the fair-haired smiled. "You never know what will happen next minute."

Her phone trembled, and the woman waved to them as if to say: see?

"Yes, Emil, what happened?" She spoke into her earpiece.

Nika looked at the peacefully swinging algae, and fish scurrying between them for the last time and went to look for the roborabbit — its buzz was already heard around the corner.

TASK

Come up with similar stories based on the following case study, vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

● How many different specialists do you need to complete a task?

● What might the room where the characters work be like?

● What conflicts and surprises may arise during the course of work?

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Case. It is necessary to develop a program to clean up the coastal waters from waste in the Gulf of Finland. Moreover, the garbage should be caught by marine robots. It is important that robots do not interfere with ships sailing to and from the port.
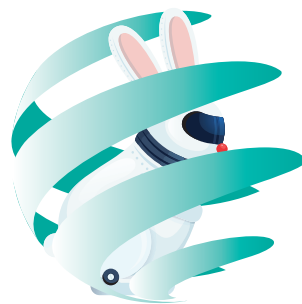
VISION OF THE FUTURE

Water transport has historically been very important for Russia, providing a link between the regions and rich opportunities for trade (the Volga trade route connected Scandinavia with the Arab caliphate, and the route "from the Varangians to the Greeks" with Byzantium). Although its importance has decreased in recent years, it remains an important sector of the transport industry, especially in the field of freight transportation. The active use of the Northern Sea Route, which the shortest route between the European part of Russia and the Far East — will give the industry a chance for a revival. Then Russian water transport can again begin to play an important role in transport between Europe and Asia.

Now, the sea transport system is developing a multimodal transportation system (cargo transportation under one contract, but with different modes of transport, for example, by rail, and by sea), intelligent control systems are being applied, new types of fuel and new materials are being introduced. Systems are also being developed for automatic navigation of ships as software is capable of real-time plotting an optimal route for ships. Important criteria are fuel economy, shortening the route, forecasting the best day to go to sea, and tracking weather conditions. Data is collected and synchronized using the global navigation satellite system. In addition, unmanned technologies are developing in water transport, as well as inland. They need telematic systems and intelligent control systems, as well as an appropriate infrastructure.

By 2020, shipping greenhouse gas emissions are projected to increase by more than 30%. Therefore, an important task is to develop, using new materials, additive technologies, and virtual modeling, more environmentally friendly and energy-efficient vessels. We will also need a more compact and energy-efficient on-board equipment and a sensor system for predicting and timely detection of breakdowns.

But the seas and oceans are not only a space for movement but also sources of valuable resources: minerals, biological resources, even electricity. Oil and gas can be extracted in the ocean. This requires new autonomous power sources, because the resources of diesel generators are not enough. In addition, underwater power plants can use the energy of the tides. This requires turbine generators, similar to wind turbines. At the same time, the movements of the tides are much more predictable than the strength and direction of the wind, and because of this, it is more effective.

In equatorial waters, conversion technology can also be used in energy extraction from temperature differences on the surface and in the depths of the ocean, the minimum difference should be 20 degrees Celsius. Such power plants are independent of the current and can stably produce energy, and as a side effect, they desalinate part of the water, and it can be used for drinking.

It has long been planned to create the International Ocean Station, where oceanographers, marine engineers, biotechnologists, farmers, doctors, and designers will live and work. Most likely, such a station will have a modular structure, so it can be changed when necessary.

For communication in the ocean, an underwater Internet of Things is being developed — a scalable system that allows you to receive data from autonomous underwater sensors and determine their location on a time scale close to real, as well as control underwater robots via the Internet. At the same time, modems should not only be waterproof but also consider the specifics of signal transmission in a liquid medium.

In order to develop the ocean, we will need underwater robots. They are able to operate in any region of the ocean, help with the extraction and processing of minerals, take care of bioresources (for example, algae farms), monitor the state of the ocean, and work at marine power plants. Underwater robots will need unified sonar aids to navigation and communications, underwater wireless communications, optical aids, and laser television systems.

New generation underwater robots are often created similar to marine fauna. For example, the American company IS Robotics created a robot named Ariel (hello to Disney!), similar to a crab. This design is very useful,

because crabs have a shallow center of gravity and are difficult to turn over, which will make the robots more resistant to currents. Mitsubishi created a coelacanth-like robot, and the British BMT project launches robotic fish off the coast of Spain to detect chemical leaks from ships. In Russia, underwater robotics are actively developed in the Far Eastern Federal University. In 2019, the team of the University and the Institute of Marine Technology Problems took silver at the international championship in underwater robotics.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

ARCTIC NAVIGATION EXPERT

A specialist who understands the features of ice navigation in the Arctic. He or she can plot optimal routes for ships and, in unusual situations, make quick decisions about their change.

CROSS-PROFESSIONAL SKILLS

MARINE INFRASTRUCTURE SYSTEMS ENGINEER

A professional who develops and implements technologies that increase the stability of coastal structures and ships to various types of threats, both natural and man-made. Similar specialists are being trained today majoring in Shipbuilding, Ocean Engineering and Systems Engineering of Marine Infrastructure Facilities. However, new technologies and an increase in environmental requirements will change the functionality of the profession.

CROSS-PROFESSIONAL SKILLS

PORT ECOLOGIST

A specialist who monitors the environmental safety indicators of the port, ships, and the environment (water, air, surrounding areas, plant and animal populations in and around the area). He or she develops programs to restore the ecology of the port and the water area.

CROSS-PROFESSIONAL SKILLS

DESIGNER OF MARINE ROBOTS

A specialist who develops underwater robots. At the same time, he or she takes into account the specifics of the environment, including currents, water resistance, weakness of the information signal, corrosion, etc.

CROSS-PROFESSIONAL SKILLS

MARINE ROBOT REPAIRMAN

A specialist who repairs marine robots. It is possible that repair crews will work at sea stations and ports, combining specialists with different skills: electrician, mechanic, radio acoustics specialist, etc.

CROSS-PROFESSIONAL SKILLS

DEVELOPER OF AUTOMATIC SHIP NAVIGATION SYSTEMS

A professional who creates software that helps ships navigate the best route based on weather conditions and the trajectories of other ships.

CROSS-PROFESSIONAL SKILLS

ENERGY-EFFICIENT SHIP DESIGNER

A specialist who creates more environmentally friendly versions of ships that use less fuel, have less leaks, built using energy-efficient materials, etc.

CROSS-PROFESSIONAL SKILLS
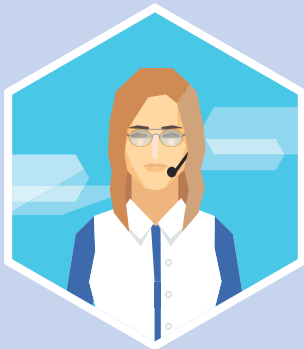
UNMANNED WATER TRANSPORT MANAGER

A specialist who monitors the trajectories of unmanned vessels and in a critical situation can redirect them to avoid an accident.

CROSS-PROFESSIONAL SKILLS

CYBER TECH ENGINEER OF UNDERWATER INTERNET OF THINGS

A specialist who develops networks of underwater modems and access points and manages their implementation on the ground.

CROSS-PROFESSIONAL SKILLS

UNDERWATER POWER DESIGNER

A specialist designing underwater "windmills" that generate electricity through the power of waves, as well as power plants using conversion technology.

CROSS-PROFESSIONAL SKILLS

NEW MATERIALS AND NANOTECHNOLOGIES

Letting go of the ears of the robotic rabbit, Nika almost squealed. It seemed to her that she was hanging in the air without any support. Just looking closely, she realized that she was standing on a transparent surface: either plastic or ultra-hard glass. A room entirely made of unknown material seemed to float at a height. And below, there was a long winding track: looking more closely, Nika could see treadmills with obstacles, steep climbing slopes, and even an oval-shaped ice lake as it sparkled in the sun like a fancy mirror.

It must be a sports track, Nika thought. And here is something like a commentator's booth.

An automatic door hissed behind her. Nika turned around. Three walked out of the lighted elevator into the room.

"Ah, the intern!" greeted the girl in front; there was a butterfly tattoo on the left side of her neck. "Welcome to the Seventh International Cyber Race. I am Lada, a senior composite engineer. This is Emily, our sensory designer. And Boris, he is engaged in nanoelectrics."

"Very nice. Sorry, cyber what?" Asked Nika.

"Cyber Race. Sports competition for augmented people."

"Yeah, Lada, you made everything clear right away," the designer sneered, a girl in a cozy red home-knitted sweater. A small speaker was attached to the collar of the sweater, and although she spoke English, Russian came from the speaker, as in simultaneous translation.

"I explain it in a human way," Emily continued through the automatic translator. "Athletes with disabilities, who decided to upgrade their body, participate in the cyber race."

"Upgrade? How, like cyborgs?"

"Well … yes, but the word is actually not very polite. You see, a person just would not install a steel leg. These are people with disabilities, and prostheses and implants give them a normal, complete life.

"Guys, it's shameful to interrupt the lecture on humanism," the nanoelectric added, "but we have a countdown. Broadcast in three minutes."

Lada snapped her fingers, and keyboards, monitors, and turntables made of the same transparent material left the openings in the transparent floor.

"The consistency of materials is normal." Lada scanned the readings on the monitor. "The density of the running surface is normal. Climbing barriers are normal."

"What does it mean by being normal?" asked Nika.

"The augmented athletes are capable of such physical exertion that we would not have cuddled," the designer explained. "Run faster, hit harder, jump higher. The tracks on which ordinary athletes compete will not suit them."

"Two minutes," said the nanoelectric.

"Therefore, we are creating special artificial materials for the track," said Lada. "The obstacles on the treadmills are stronger and higher than usual, and the rocks are smoother and steeper than in nature. Otherwise, the athletes will not have a challenge. Do you understand?"

Nika nodded. Now, she herself noticed that the obstacles seemed almost insurmountable: tall, in two or three human height, blocks of some kind of durable metal. You will not jump over such a barrier.

"One minute," said the nanoelectric.

"Connecting to the sensors," the designer responded.

On the screens in front of them appeared silhouettes of human figures in a web of luminous lines and dots. Next to each figure, a window popped up with the name, surname, and scrolling data lines.

"Are these the athletes?" Nika guessed.

"Yeah. At competitions, they wear special sensory costumes. So, from here, we can follow their heartbeat, read biorhythms. Even video calls can be done. Look."

The designer clicked a button, and a moving image appeared on the screen. The owner of the suit had just stepped out on the track and was warming up, right in front of him, was a partition separating the launch pad from the obstacle course.

"Boris, what about the batteries?" asked Lada.

"Last debugging," the nanoelectronic knocked on the keys. "So, now we calibrate … The batteries are ready!"

"What are the batteries?" Nika asked.

"Microbatteries are built into each suit," Boris explained. "They charge prostheses and implants, allow them to work."

"Well, it is necessary to charge them constantly!"

"And here it is." Batteries receive energy from movement. So, the athlete can recharge the implant.

"But if cyber sportsmen have such abilities, where do they train?"

"We also design training centers specifically for them," Lada replied. "Look."

A video appeared on Lada's screen. Nika had not seen such a strange training room. Treadmills right in the process changed shape, bent, and swelled. The light from the windows was diminishing, now suddenly flashing more than once every five seconds. The windows kept opening on their own. It must have been the way the room was ventilated.

"These two," said Lada, "have a particularly good chance."

She paused the video, zoomed in and enlarged two faces. "Ted Tannen," Nika read the subtitle under a tense, aggressive face as if composed of four bricks. "Andrzej Dombrowski," a signature appeared under the face of a tall, thin blond man who, it seemed, could not help smiling. The corner of his mouth was mischievously raised all the time.

Nika looked at their prostheses with curiosity. Dombrowski's right hand was wearing a black leather glove. Just a closer look, Nika realized that this was a very smooth matte black metal. Looking at Tannen, Nika involuntarily flinched. The athlete had no legs: from both knees, there were interlacing of steel pins, pistons, and gears.

"Both are world-class guys," said Lada. "But Dombrowski was cool before the disability. Tannen blossomed precisely as augmented, before playing in local leagues."

"They even say he's voluntary," the designer whispered conspiratorially.

"What is it like?"

"Rumor has it that he did not break his legs in an accident. He did it to himself to upgrade. He wanted to surpass human capabilities."

"So, gossip set aside!" Squealed Lada. They go out.

And in fact, a second later, a melodious signal sounded over the track. Nika saw how slender fit figures in multi-colored costumes lined up below on the launch pad. Athletes prepared for the start. Drones with video cameras scurried over the track, shooting athletes on different planes.

"Emily, check them out," Lada ordered.

The designer enlarged the video image of each athlete.

"If one of them took a dope, the suit would react to the chemical components in the sweat and change color," she explained to Nika. "In the meantime, everything is clear. You can start."

Lada snapped a key. The partitions separating the launch pad from the main track have moved apart. Athletes took off.

Nika didn't watch sports competitions very often, but she learned that in any competition, the rules and possibilities of each athlete are rather strictly regulated.

It was different here. Three athletes, faced with an obstacle, overcame it in three different ways. Nika saw how a feeble black guy slipped on his prostheses into the narrow gap at the bottom of the obstacle, got up, and, without slowing down, rushed on. Tannen jumped over the wall without running away: his mechanical legs seemed to toss him up. Dombrowski, without slowing down for a second, smeared a prosthetic fist at the obstacle. The design scattered, and Dombrowski rushed after the rivals.

It quickly became clear that the struggle for the championship will go between Tannen and Dombrowski. The structure of the rocks changed almost every second: under the feet of athletes, potholes and dips suddenly appeared, sharp protrusions grew where they just weren't. Several people fell off the cliff and hung on the insurance, not having time to change. But Tannen and Dombrowski scrambled to race farther and farther, and if Tannen was actively working with mechanical legs, then Dombrowski simply bit into the stone with his prosthetic hand: he left behind a whole trace of potholes in hard stone.

After a few minutes, it was all over. The first to arrive at the finish was Tannen. Dombrowski literally did not have a few seconds. It was time to announce the results.

"Is there a judge here?" asked Nika.

"Yes," said Boris, "but this is more a formality. The result is recorded by the computer. The judge intervenes only if something out of the ordinary happened. Uh … that seems to be that case."

A curly brown man of about forty-five entered the booth.

"That's right. I called him," Lada turned.

"Good afternoon, colleagues," the man said softly. "So, why do you think Tannen is unclean?"

"Look," Lada set the race record to slow motion. Tannen fled easily, as if not touching the ground. "See? Somehow, he is running too fast!"

"But they checked him, and he has nothing in his blood."

"We need to check the prostheses."

The judge nodded and pulled out a smartphone.

"Hello, call Tannen to call room 2. Urgent. Need a medical examination! No, the results are not yet announced."

"I admit, I don't understand what the problem is," a short man grumbled in a tweed jacket. He spoke French, so Nika had to put a translator in her ear.

They sat in a spacious meeting room. Specialists, on the one hand; Tannen, red from running and indignation and a calm man next to him, on the other. Nika was introduced to him as biomimetics, but the girl could only guess what that meant.

"I made the prostheses by personal order of Mr. Tannen, taking into account all the requirements," the man continued. "I have conclusions from the hospital I can show!"

"There is one problem, Bob," Lada frowned. "We did a scan, and in Mr. Tannen's prostheses, some of the components are made of beryllium. You know that this metal is two times lighter than the competition norm, which means it gives an unfair advantage."

Tannen did not move on Lada's words, but Nika caught a glimpse of alarm in his eyes.

"Beryllium? Nonsense! Let me …" Bob pulled out a tablet and tapped it with his fingers. His eyes widened: he was shocked and angry at the same time.

"Now, do you believe?"

"Believe me; it would not have crossed my mind to install it to a human!" Bob's cheeks turned red. "Ted, what did you do?!" These are pure toxins!

Tannen was silent. On his cheekbones came nodules.

"If you didn't do it, then who?"

"I'd venture to suggest that Mr. Tannen turned to not so honest people like me, without my knowledge," the biomimetic said. "Of course, they do not care about the health of the client. Prolonged contact with beryllium can cause serious poisoning and even provoke the development of tumors!"

This news did not seem to impress the athlete. His face remained a stone mask.

"Thanks, Bob. Mr. Tannen seems to be lucky to be exposed." Lada shook Bob's hand and turned to Ted. "Mr. Tannen, I have to inform you that you are withdrawing from participation in the Seventh International."

"What?" Tannen suddenly came to life. "Not! You cannot!" He jumped up from his chair, turning his eyes and waving his arms, like crazy. "You can't! I've been going to this for ten years!"

Out of the corner of her eye, Nika noticed how Boris quietly pressed a button.

"This is not a violation! I can prove it!" Shouted Tannen. It seems that the disqualification scared him more than possible death. With a heavy step, rattling prostheses, he moved toward Lada.

The elevator doors swung open. A few more pairs of legs in heavy boots stomped across the transparent floor.

"No! You cannot!" Tannen tried to escape from the hands of the guards, but could not. "I won!" He shouted while he was being taken out.

Dombrowski leaned on a pedestal, taking a well-deserved medal from the hands of a judge. He glowed with happiness. But Nika was sad.

"It turns out that cyber prostheses are dangerous for people?" the girl asked.

"It's not about prostheses," Lada replied. "There will always be people who use technology irresponsibly. Tannen wanted so much to be the best that he poisoned himself for the sake of an advantage over others. Problem is related to—"

"The reason, not in technology," Nika finished.

"Exactly."

Nika delicately rubbed the ear of the roborabbit with her fingers.

TASK

Come up with similar stories based on the following case study, vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the room where the characters work be like?

- What conflicts and surprises may arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case 1. It is necessary to develop wearable gadgets for employees of the Ministry of Emergency Situations with sensors detecting explosives, radiation and chemical pollution, and also to check their work on a computer model.

Case 2. You are asked to create biomimetic material for thermal insulation, following the example of polar bear fur. Hair should be flexible, water-repellent, and have minimal thermal conductivity. In addition, you need to understand what sectors in which there will be a demand for such material.

VISION OF THE FUTURE

Technological progress can be felt literally by touch. We not only more efficiently use familiar materials but also create new ones with desired properties. With them, we can create better products and develop new technologies — in the aerospace industry, medicine, energy, engineering, construction, and many other industries.

Composites became a real revolution in materials science. Composites are complex heterogeneous materials consisting of a reinforcing component and a matrix and having increased strength, lightness, and ductility. In addition to the already familiar plastic and metalized composites, glass-based composites are widely used. In the future, composite structures can be filled with smart components, chips and controllers which will allow us to change the properties of premises and equipment at our discretion. For example, to automatically move or even transform furniture, change the level of illumination, etc. This will lead to the appearance of active environments — working, residential and educational spaces, controlled by intelligent systems and/or the user, depending on the necessary tasks or mood.

Shape memory alloys help solve complex engineering problems in aerospace engineering, instrument making, and medicine. For example, titanium nickelide is the most famous of these alloys, which is used to make prostheses that replace joints. The prosthesis is introduced into the body in a compressed form, and then under the influence of the heat of the human body, it takes the necessary shape.

Another crucial area is the diagnosis of new materials. Scientists are interested in the possibility of detecting damage in composites as quickly as possible. For example, in February 2016, the German aerospace center tested a diagnostic system consisting of 584 sensors that were embedded in an aircraft part made of composite materials. When starting the diagnostics, ultrasonic emitters were triggered, and their signal was received by sensors. If there were defect in the material, it would begin to deflect the ultrasound, and the sensors showed that something was wrong. In addition, materials already exist that can heal defects that arise in them. Thin-walled capsules with a healing substance are added to the polymer. When a crack occurs, the drug is released, hardens and tightens the crack.

Another important invention was 3D printing — the ability to recreate any objects using special compositions, whether it be a computer board, musical instrument, weapon, or medical prosthesis. Discoveries in this industry can improve the properties and stability limits of materials, mechanisms, and structures.

In addition, the advent and development of 3D printing heralds a new era in production: final products can now be created not at special enterprises, but actually at home, which means that every consumer can become a manufacturer. Home 3D printers are getting cheaper as the most affordable models are now starting at $500, and enthusiasts are posting more and more drawings to the internet so that anyone can print a variety of things. And, of course, new materials are created specifically for 3D printing: for example, Glassfil is a transparent thermoplastic that transmits ultraviolet and X-rays but reflects infrared radiation, or PVA plastic to create auxiliary structures that need to be removed later. It dissolves with water. In addition, 3D printing technology allows you to automate the production of products from polymer composites, which was previously considered impossible due to the complex structure of the material.

Photonics (the field of science at the junction of optics and electronics) is considered one of the most promising scientific areas: it is a priority in the United States, Britain, South Korea, and other countries. Specialists in photonics create very accurate lasers, heavy-duty microscopes, improve the properties of LEDs, come up with photobactericidal materials, and solve many other problems. Another important area is computer modeling of physical and chemical processes occurring in the matter. It will accelerate the development of new materials. One of the most common modeling methods is molecular dynamics: in this model, atoms look like balls and interact with each other in

mathematical functions that mimic physical processes.

Artificial materials can be created based on the principles of wildlife or make them look like biomaterials. For example, water-repellent paints and fabrics mimic the texture of lotus leaves, and heavy-duty polymer nanofibers were created with an eye on the web. In medicine, biodegradable materials are actively used, which, over time, are destroyed and excreted from the body without harm. Such materials are needed for the cultivation of artificial organs or the manufacture of prostheses and implants. Technologies are also being developed for bio-mimetic preparation of nanoparticles. For example, iron oxide and cobalt oxide nanoparticles are needed to create new materials that can be obtained using ferritin protein (it transfers and stores iron in the body). This method of producing nanoparticles is more environmentally friendly than physicochemical methods.

Microchips are becoming smaller, faster, and consuming less energy, it became possible to make even single atom devices. But to solve such problems, new materials are needed (in particular, graphene). Also, in this area, you can use the technology of molecular self-assembly — a method in which molecules themselves line up and connect with each other (for example, liquid crystals are formed).

To produce more compact, durable, and capacious batteries and accumulators, new chemical current sources are developed, and nanoparticles are also used there (this type of technology is called nanoionics). The latest-generation Toshiba lithium-ion battery can charge up to 80% in 60 seconds. Some scientists are trying to create nanoscale batteries; for instance, employees of Sandia National Laboratories (USA) are developing a microscopic battery that can be implanted in the human eye.

Nanotechnology also helps with targeted drug delivery, i.e., the transport of a drug molecule to target cells using a controlled carrier (cells, molecules, or particles). In this case, the carrier should not itself enter into chemical reactions that would affect the interaction of the drug with cells, and the drug should be released only after delivery. Nanoparticles of proteins, gold, iron oxide, and other organic and inorganic substances are used to deliver cancer drugs.

Modern polymers can significantly change their properties when in contact with certain substances, and this can be used to create sensors. "Electronic noses" are being developed that are sensitive to odors. The basis for chemical sensors are nanocomposite materials, including nanoparticles of metals, metal oxides, polymers. "Electronic noses" can be used in medicine (diagnosis of diseases by the smell of breathing and secretions), safety (detection of explosives and drugs), mechanical engineering (self-diagnosis of devices by smell), and in many other areas. For example, researchers from New York made a paper sensor coated with nanoparticles, which response to food spoilage by a color change.

Information technology also helps in materials science: new materials can first be developed in digital form, based on computer models that simulate various physical and chemical processes. This technology also helps to speed up the verification and practical implementation of new developments, which means they will quickly reach the consumer.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

BIOMIMETIC

A specialist who develops artificial materials, inspired by the principles by which wildlife operates.

CROSS-PROFESSIONAL SKILLS

SECURITY SPECIALIST IN NANOINDUSTRY

A professional who is responsible for the safety of workers in the field, end-users of the product, and the environment. He or she develops programs to quickly respond to the negative consequences of the production or use of nanoproducts.

CROSS-PROFESSIONAL SKILLS

SMART MATERIALS DESIGNER

He or she develops composite materials as part of smart environments that change properties for the tasks of home, office, industrial enterprise.

CROSS-PROFESSIONAL SKILLS

GLAZIER

A specialist in the development and manufacture of glass products based on glass composite functional materials.

CROSS-PROFESSIONAL SKILLS

RECYCLING TECHNOLOGIST

A specialist in the development and implementation of technologies for a waste-free production and reuse of materials, as well as the creation of new materials from industrial waste. In this, he or she is assisted by special computer programs that record all useful components that are in the waste or can be obtained during processing in one way or another, after which they offer options for further use. In Russia, the technologies of lean and environmentally responsible productions are only just beginning to be mastered, while in the West, they are already actively used it.

CROSS-PROFESSIONAL SKILLS

NANOTECHNOLOGY DESIGNER

A professional who, using digital models, experiments with the properties of nanotechnological materials, and predicts their life cycle. Highly skilled programmer with good knowledge of nanophysics and nanochemistry.

CROSS-PROFESSIONAL SKILLS

COMPOSITE SYSTEMS ENGINEER

A specialist in replacing traditional materials with composite materials. His work is relevant in construction, engineering, robotics, medicine, etc. The engineer will design new materials with a variety of parameters of frost resistance, brittleness, wear resistance, hypoallergenicity, etc., depending on the requirements of consumer industries.

CROSS-PROFESSIONAL SKILLS

TRANSLATIONAL NANOTECHNOLOGIST

A specialist who accelerates the application of research in the field of nanotechnology, adapting existing production systems to the use of new materials, as well as finding ways to quickly move from research and experiment to pilot development and production (including using computer models).

CROSS-PROFESSIONAL SKILLS

CONSTRUCTOR OF MICRO- AND NANOELECTRONICS

A specialist creating high-performance computing equipment based on memristors[*] and new portable electronics (including those based on carbon nanomaterials).

CROSS-PROFESSIONAL SKILLS

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* Memristor (from memory resistor) is an electrical component able to store and proces information. Memory devices, which use memristors will be more compact and energy-efficient.

SENSOR DESIGNER

A specialist developing new materials for sensors for a specific request. For example, for an airport security system or for packaging that helps track the expiration date of products.

CROSS-PROFESSIONAL SKILLS

DIAGNOSTIC SYSTEMS ENGINEER

A professional who designs and integrates diagnostic systems into composite parts so that damage can be detected in a timely manner.

CROSS-PROFESSIONAL SKILLS

POWER INDUSTRY

Nika let go of the roborabbit's ears and then collapsed, flopping down on a pile of trash. Something painfully rested against her side. She fumbled with her hand and pulled out a bicycle saddle from underneath. She got up and looked around. The room was small, with a low sloping ceiling, and old broken things occupied almost all the space. Clearly, it was someone's attic.

Nika rubbed her bumped side and awkwardly got up, went down the rickety stairs, and froze. A man in inconspicuous clothes walked along the corridor, without noticing her. The first moment, she thought it was the master of the house, but the stranger behaved weirdly. He slowly wandered along the corridor, looked closely at the wires, and touched the walls. He looked into a room, and another, as if looking for something.

From the ground floor below, an elderly but still sonorous female voice rang out.

The sound of pulled chairs and dishes was heard. The old lady calmly drank tea while the stranger roamed the first floor.

Having finished with three rooms, he moved on, and Nika rushed to the nearest door, or the stranger would have noticed her behind the stairs. She looked around for any weapon, and grabbed a vase from the stand, carried it overhead, ready to bring it down on the villain.

Her predictions came true. Not even a minute had passed before the door opened. Nika got ready to attack, but at the sight of her, the stranger staggered back and waved his hands.

"Hey, hey, watch out! What are you doing?"

The girl froze with a raised vase.

Do criminals act like that? Nika was confused, but she didn't express it.

"What are you doing?" She rushed to the attack. "You are walking here, taking a thorough look around. Do you want to steal something? I warn you, if you move, I will scream!"

"To steal?" the man laughed. "I do not steal. On the contrary, I help to save."

"And who are you then?" Nika, relieved, lowered the vase. The hands managed to leak.

"Anton Golukhov, energy auditor." The stranger gave her a joking bow.

"I'll better show you. Come, see for yourself!"

Still, in doubt, Nika let the energy auditor forward, and he grinned. She had to admit, if he was a criminal, then he was somehow completely atypical. They went down into the spacious living room, where it was as if two eras fought.

Flower tablecloth on the table and lace tulle diluted the laconic design of the room, glasses in a simple rim coexisted with VR glasses, and the curved screen on the wall was decorated with a knitted napkin. When Nika and the redhead appeared, the company sitting at the table started up.

The elderly woman, whose voice must have been heard earlier by Nika, hurried to them.

"Finally!" She said. "Sit down, sit down, my good ones. The tea is getting cold."

She sat the new arrivals, pushed graceful cups, and began to put on saucer jam.

"Thank you, but you don't need to," protested Nika, but the old woman did not listen to her.

"How is it not necessary? You are so skinny! And this is my homemade jam. I picked up raspberries, and I cooked this jam myself."

"Mom," a big man of about forty on her right hand, boomed, "you shouldn't make her eat it!"

"Kolya!" the old woman threw up her hands. "But am I forcing?" She then gazed at two women sitting at the table, and they hastily took up their jam.

The energy auditor politely took a sip of tea and spoke: "I examined the house, checked the counters, appliances, and payment data. The condition of the house is good, and urgent replacements are not required. According to the analysis, the most energy is consumed by air conditioning and a water heater, but the most inefficient use is the dishwasher, far above average." He looked at the smartphone and continued. "The house is too big, it won't be able to provide enough alternative electricity, but if we install solar panels and windmills, up to 70% can be produced by them."

"But where do you put them?" Nikolay frowned. "Do you want to cut apple trees? You will dig everything up here, litter on the site, and nobody will be able to pass here later."

"Oh, Kolya," the old woman waved at him. "It's not like that at all! Tell him, Vasyunya."

"Who is Vasyunya?" Nika asked.

"Well, Vasyunya," the old woman said, and struck out, "Local power supply system's specialist."

"Who is this?" Nikolay frowned even more.

"Vasyunya is me, Vasilisa," a full-blown blond woman smiled. "Larisa Evgenievna said everything correctly. I help to provide private facilities with local sources of energy."

"And it saves energy and has a positive effect on the environment," broke in the old woman.

"And about the space on the site …" the specialist continued. "We will install panels on the roof, and it is suitable. A wind generator is just a pillar. It won't take up a lot of space, and it will not stick out high. It is dangerous to put it too high, as it might end up being struck by lightning."

"I understand the solar panels," Nikolay reluctantly agreed. "In the Urals, there is a lot of sun. But the windmills … Do we have so much wind?"

"The main source will be the solar panels." the specialist nodded.

"The wind generator is auxiliary and will mainly operate in autumn and spring."

"But your boy said up to 70%," the old woman looked at her anxiously. "Where does the other 30 come from? I read TPPs are terribly harmful!" and absolutely not changing tones, she added, "Please, eat some jam."

"TPPs are now completely different from twenty years ago," a specialist in local systems dutifully scratched a spoon on a saucer. "Today thermal power plants produce 90% less emissions. And I suggest taking energy not directly from the TPP, but from a battery station. It supplies energy, redistributing it depending on your needs. Then the TPPs will burn less coal and make less impact on the ecology."

"This is good," the old woman rejoiced. "And I read that you can still save energy with all kinds of technical devices … "

"Why are you saving?" scoffed her son. "As if there is no money …"

"Kolya, why are you interrupting! So, can I?"

"Sure, you can! Anya," the specialist nodded at the second woman, a dark-skinned brunette, "She is an energy systems developer. She's just telling how to equip a house so that appliances spend less."

"We won't completely rebuild the house." The developer shook her head. "But we can make it smarter. We will supply the house with sensors that will automatically measure the temperature so that the air conditioning and heating are turned on only when the room is cold or hot; the light turns on and off when you enter and leave the room."

"That's lovely!" the old woman was delighted and poked at her son's side. "And Kolya constantly forgets and leaves the light on in the toilet all night."

Nika barely restrained herself so as not to burst out laughing. The burly man turned red. "Mom," he hissed, trying unsuccessfully to speak quietly, "stop it."

"Oh," the old woman dismissed. "As if such a secret, my son goes number one."

The women looked at each other, hiding a smile. The developer of energy systems continued, checking with her smartphone, "The energy auditor noted that the water heater and air conditioning consume the most energy. The fact that the air conditioning and heating will stand in automatic mode will solve the problem. Now only the dishwasher is left to deal with."

"So, what, will mom wash the dishes with her hands?" snorted Nikolay. "I'm not for that. I bought an expensive dishwasher for her."

"Expensive doesn't mean it's the best. Your dishwasher is too big. It's intended for a family of 5–8 people, and according to the audit, in 73% of cases, your mother uses it alone, and only in 3% of cases, it is used to wash the dishes for more than four people. Based on this, it turns out that you spend extra water and electricity. I will send you a list of saving models," said the developer, and with a smile, she added, "There are also luxury ones."

"Girls," the old woman's eyes glittered, "but I read on Reddit that there are things that generate energy while you walk. I love walking! Maybe I can buy a hat with solar panels? Both beauty and benefit…"

"It is possible," the specialist in local power supply systems pulled out the telephone. "We have a designer of wearable energy devices. He will make such a hat made-to-measure. Do you want it right now?"

"I'll buy whatever hat you want!" Nikolay jumped up from a chair; his face turned red. "Previously, they sold us smart pans, now this generating energy hat! Thank you, we can afford to spend money on electricity without walking in idiotic hats! And how much will all this house remodeling cost?!"

"Kolya! What are you…?" the old woman threw up her hands. "What does money have to do with it! Our generation has harmed nature too much. They did not think about the consequences at all. At least now, I'll reduce my… this … ecological footprint."

"Previously, you lived and did not care."

"Yes, I didn't care about it," the old woman raised her head. "Until your Dasha was born. When she was born, I started to think about what I will leave to her. I have enough for my time, but what about her…"

"What will she have?" Muttered Nikolay, but not so confidently. "I will provide for her."

"Will you provide her with clean water? Absence of plastic in fish?" the woman shook her head. "And her grandchildren? What about them?"

Nikolay rubbed his nose and looked off to the side. "Okay, what's there … If only you'd like it."

The old woman pressed her hands to her chest and suddenly swept over.

"Dear me!" She rushed into the kitchen. "I forgot about the pies in the oven!"

Nika followed her gaze and noticed two white rabbit ears at the window.

"Thanks for the tea," she said embarrassedly, "but I have to go …" She said goodbye to adults and went to the door, trying not to inhale once again the tempting smell from the kitchen.

At the door, the older woman caught up with her. "On," she held out the paper-wrapped pies. — "For your travel."

The girl hesitantly twisted the treat in her hands.

"Do not worry! It's recycled paper," the old woman winked at her and saw the robotic rabbit behind Nika. "Oh, so pretty! Does it chew a lot?"

"It only chews on my nerves during touchdowns," Nika smiled, and the roborabbit offendedly squeaked.

TASK

Come up with similar stories based on the following case, the vision of the future, and list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the room where the characters work be like?

- What conflicts and surprises may arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. Winter is coming, and meteorologists promise terrible cold weather in the Ensky region. You need to reconfigure the operating modes of local TPPs, as well as connect to the system local mini-power plants and energy stores that would help redistribute energy.

VISION OF THE FUTURE

Electricity has long been deservedly considered the "blood of the economy," and with an increase in the number of devices that surround us, our dependence on this industry will grow. In order to maximize the needs of society and ensure cities from disruptions in the supply of electricity, distributed generation technologies are being developed. It implies the construction of additional small sources of electricity near residential areas. Then, even if a disaster or hacker attack occurs and disables all the backbone networks, a district will be able to get connected to a local generator for a while, for example, to a gas turbine power plant or cogeneration plant. The Russian energy system remains aloof from this process. However, there are still examples of distributed generation in certain regions. For instance, in 2017, Surgutneftegas built an associated gas power plant*South Nyurymsky deposits in the Tyumen region, and one of the residential neighborhoodsYuzhno-Sakhalinsk receives electricity and heat from an autonomous energy centre.

In the frame of the EnergyNet Roadmap of the National Technology Initiative, it is planned to increase Russia's share on the global market of intellectual management of distributed energy up to 3–6%.

In any case, in 2025–2035, it will be necessary to reconstruct or replace the most worn-out domestic thermal power plants, and distributed local stations will be able to make this process cheaper and more efficient. Alternative energy sources are also developing the share of solar and wind energy, and technologies are developing to make it more effective.

In 2018, the share of renewable energy in EU electricity production reached 32%. Denmark intends to completely abandon fossil fuels by 2050, and in Sweden by 2040. Solar panels become thinner and more flexible. Soon, they can be bought in rolls and used on any surface. Most likely, even on windows, the SolarWindow startup has created a transparent solar wrap that will not be visible on glass, and it will be able to generate 50 times more energy. For greater efficiency, you can combine solar and wind power generators.

In most areas, when the sun is shining, there is usually no wind, and vice versa; therefore, a hybrid installation can work almost continuously. Private alternative energy will be actively developed in the future. This will lead to the fact that people everywhere will produce energy privately, and the "excess" energy received by them will be redistributed and sold.

One of the symbols of a new environmentally responsible society will be nuclear energy capable of ensuring stable electricity prices and minimum environmental impact: emission of greenhouse gases and carcinogens, an important side effect of coal and fuel oil stations, which still represent a significant share of traditional energy. There will be more nuclear power plants in the world, and their level of security will be significantly higher.

In addition, there will be the use of new technologies to reduce the amount of radioactive waste. In fast neutron reactors that operate in a closed-loop, this waste can be reused for energy production after special processing.

In addition, nuclear power plants can be used for the desalination of seawater, and this is an important advantage, considering that by 2050, about 40% of the world's inhabitants will experience a shortage of fresh water.

Thermal power plants (TPPs) are now considered the most harmful to the environment.

However, due to their low cost, they remain competitive, despite the development of nuclear and alternative energy. New technologies (e.g., HELE** and CCUS***) will increase their efficiency and reduce emissions of CO_2 when burning coal.

At the same time, hydrogen energetics is developing. Major manufacturers of power

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*   Power plants that use gas that is released during oil production. You can kill two birds with one stone: generate electricity and recycle waste.

**   High Efficiency, Low Emission.

***   Carbon Capture, Use and Storage.

equipment, including Mitsubishi Hitachi Power Systems (MHPS) and General Electric Power, are already developing gas turbines for hydrogen energy, and the Russian company Rosatom at the end of 2018 included it in the list of priority areas of technological development.

So far, hydrogen energy is too expensive for mass use. Hydrogen fuel is obtained by the electrochemical splitting of water, and for it, platinum catalysts are used. But scientists are developing alternative catalyst options to reduce the cost of the process — for example, catalysts on ruthenium or copper base. In addition, the British recycling company Waste2Tricity intends to create a plant for the processing of plastic waste into hydrogen. By the use of this technology, the plastic is placed in a sealed chamber and heated to high temperatures. Plastic emits gas, which is then converted to pure hydrogen.

Electricity can also be generated from biofuels. This solves not only the problem with energy but also other problems. For example, this way, you can recycle biowaste and get highly effective fertilizer as a by-product.

In Russia, there are still few biogas power plants, but they are already appearing. For example, a power plant in the village of Doshino, Kaluga Region, or Bayntsury station in the Belgorod region.

A side source of energy can also be a mechanical movement. For example, in the transport system can be used the technology of regenerative braking — this is a function that allows to recharge the battery during braking (an engine starts working as a generator). This technology is effective for electric transport because there is a big braking distance[*].

But energy production is not everything. It is important to deliver, distribute, and use electricity efficiently. Key changes in the field of energy grids and energy consumption are related to smart grids technologies. These are smartly managed grids. They define the level of energy consumption at home or office (for appliances, lamps, and sockets) and adjust the optimal operating modes of household appliances (for example, wash clothes at night when energy tariffs are lower). And they are also able to respond quickly to problems (such as power surges) and prevent damage to equipment, as well as independently recover in the event of a breakdown.

Such technologies allow to reduce losses in the transmission of energy and increase the reliability of its distribution. Besides, they give consumers the opportunity to choose their own power supplier and manage consumption and costs. To stabilize the power supply in the event of an uneven load on the network, large and reliable energy storage facilities are required. The largest rechargeable battery in the world installed by Tesla Inc. in South Australia, Hornsdale Power Reserve, already ensures a reduction in network operating costs of about 90%.

Energy production, distribution, and storage technologies will become automated and practically will not require human intervention. Besides, there will be a change in the supply modes of portable devices that make up part of our daily lives. A significant portion of the energy will be transmitted from our body with the help of energy generators sewn into clothes and shoes.

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[*] The distance the vehicle will travel from the moment the brake is applied to a complete stop.

CROSS-PROFESSIONAL SKILLS

1 Systems thinking

2 Cross-industry communication skills

3 Project management

4 Lean production

5 IT

6 Customer focus

7 Multilingualism/ Multiculturalism

8 Social skills

9 Working in uncertainty

10 Art and Creativity

11 Ecological thinking

SMART WEARABLES DESIGNER

A specialist who creates goods for personal use (including clothes and shoes) with the function of micro-energy generation. Outerwear already exists with built-in solar panels, such as Ecotech jacket, created by Italian Zegna Sport.

CROSS-PROFESSIONAL SKILLS
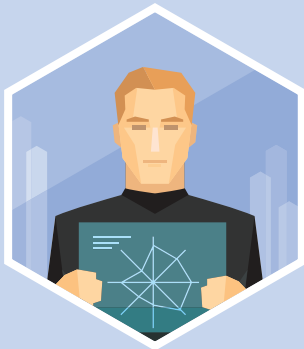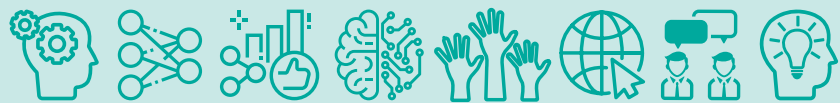
METEOPOWER SPECIALIST

A specialist who adjusts the operation modes of power and heat plants by taking into account climatic conditions and seasonal fluctuations in demand. For example, in cold winter, more heating will be needed, and in the hot summer, more consumers will use air conditioning. If you adapt the operating modes to these factors, you can save energy and avoid crashes and overloads.

CROSS-PROFESSIONAL SKILLS
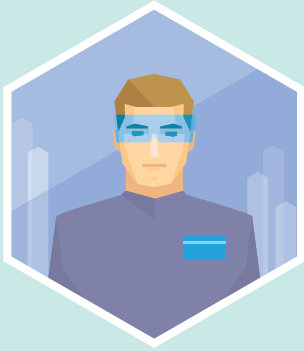
LOCAL POWER SYSTEMS SPECIALIST

A specialist who develops, implements, and maintains systems of small power generation (wind, solar, bio-atomic microgenerators, etc.). The main driver for the development of small power generation today is an increase in environmental awareness and the need for reducing consumer spending. In the West, this profession has already appeared, and in the near future, the trend will reach Russia. Help from such specialists will be needed both by the owners of country houses and when designing vertical farms[*].

CROSS-PROFESSIONAL SKILLS

[*] Farms with artificial ecosystems, which are created in urban buildings. For more details, see the chapter "Biotechnology".

ENERGY STORAGE DESIGNER

A specialist who designs various energy storage systems: high-capacity batteries, heat stores, flywheels, etc. These devices help smart grids conserve energy to deliver during peak loads.

CROSS-PROFESSIONAL SKILLS

RECUPERATION SYSTEMS DESIGNER

A specialist who develops technological solutions for collecting surplus energy of moving vehicles, primarily urban transport. In the recovery of energy, there is nothing revolutionary: regenerative braking is still applied to trolleybuses, trains, and trams. But with the increasing trend for a careful attitude to resources, the demand for specialists who are able to create similar systems will grow.

CROSS-PROFESSIONAL SKILLS

MICROGENERATION SYSTEMS DEVELOPER

A specialist in the development and design of new technological solutions related to micro energy generation according to user requirements. For example, he or she comes up with how to combine windmills, solar panels, and biogas plants on a particular farm.

CROSS-PROFESSIONAL SKILLS

HYDROGEN ENERGY DESIGNER

Specialist designing hydrogen power generation systems. Now, hydrogen fuel cells are used in vehicles (for example, in the model Toyota Mirai), in drones (like the Russian "Inspector-1"), and even in trains (e.g., German Coradia iLint). While this is a too expensive technology to use widely, scientists come up with new ways to make it cheaper, so that hydrogen energy is considered a very promising area.

CROSS-PROFESSIONAL SKILLS

ENERGY GENERATION SYSTEMS MODERNIZER

A professional who manages the modernization of cogeneration plants and power plants. He introduces modern security methods, environmental friendliness, and resource efficiency. Despite the general trend towards a variety of electricity generation sources, its lion's share will be centralized. Equipment is aging and wears out; therefore, new specialists will be in demand, especially those who will be able to implement best practices at power plants and thermal power plants. Large players on the power market today, such as Siemens, actively provide services for the modernization of generation systems, which means that in the near future, more and more specialists in this profession will be required.

CROSS-PROFESSIONAL SKILLS

ENERGY CONSUMPTION SYSTEMS DEVELOPER

A specialist who tells you how to consume energy rationally, which accounting and saving tools to use, and what to do with the most "greediest" household appliances, such as air conditioning and a refrigerator.

CROSS-PROFESSIONAL SKILLS

INTELLIGENT POWER SYSTEMS ENGINEER

A professional who designs and models smart networks, micro-generation systems, smart energy environments for a particular task, and also develops technological and infrastructural requirements for them. It solves the same problem as an energy systems developer, but from the side of energy supply. Today, in the world, there are organizations that provide similar services. For example, Siemens offers a SureGrid service that allows real-time control of energy consumption in a particular building, and the American independent operator, California ISO, develops different demand scenarios, distributes the load between suppliers of electricity, and integrates renewable energy sources into the network.

CROSS-PROFESSIONAL SKILLS

ENERGY AUDITOR

A specialist who engages in auditing and consulting in the field of energy consumption, checking private homes, residential complexes, individual buildings, factories to evaluate energy losses and find options for optimizing energy consumption. Energy audit exists today as a dedicated licensed activity, but in the future, such specialists will be in higher demand.

CROSS-PROFESSIONAL SKILLS

DISTRIBUTOR / NETWORK CONTROLLER FOR DISTRIBUTED ENERGY

A specialist who is able to analyze possible system failures, predicting optimal operating conditions, and ensuring the calculated safety of power grids and waste disposal. He or she knows non-destructive testing methods* and ways to enter the operation of smart networks.

CROSS-PROFESSIONAL SKILLS

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* Checking the reliability of an object and mechanism, in which it is not necessary to suspend its operation.

POWERMARKETER

A specialist with good knowledge of the global energy markets, who solves the problems of energy sales. The need for professionals of this kind is associated with growing competition in the energy market and the emergence of a large number of private players. There is no demand for them in Russia yet, but questions of micro-generation and distributed networks will become truly relevant. And in the world, a marketer of energy markets is a well-established profession.

CROSS-PROFESSIONAL SKILLS

ELECTRICITY CONSUMER ADVOCATE

He or she checks energy networks for safety performance, general performance, and other user requirements; he is able to provide qualified advice in the field of energy conservation legislation. Europe and US consumer protection in the field of electricity is carefully worked out, and there are many experts in this field. Specialists in these areas mainly advise how to pay less for energy. In Russia, this service will also be in demand, not least in order to deal with privileges and subsidies, the complication of which even experts complain.

CROSS-PROFESSIONAL SKILLS
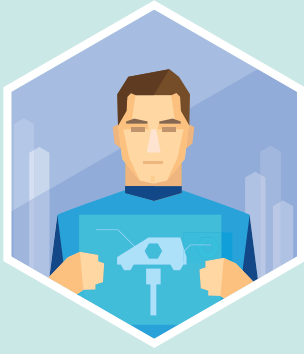
ELECTRIC VEHICLES CHARGER

A specialist who serves the infrastructure of recharging electric vehicles and other vehicles (e.g., cargo drones). Currently, the US has the most developed network, with more than 50,000 charging stations.

CROSS-PROFESSIONAL SKILLS

AGRICULTURE

Nika felt firm ground under her feet and heard a long mooing. The smell of fresh manure hit her nose. The girl cautiously turned around. Cow. A real cow! Yes, not one, but a whole herd of cows! On both sides, there were rows of corrals fenced with metal gates. The animals shifted from foot to foot, lazily chewing their lips. Everything around looked like an ordinary barn, like those that Nika sometimes caught a glimpse of in the news on TV.

…Well, almost everything.

The cows were wearing glasses. Round, tightly worn glasses with 3D lenses. They didn't seem to be bothered at all; the animals drove their heads back and forth and quietly waved their tails.

Behind Nika, there was a smooth melodic buzzing, and a car drove past, similar to a fire hydrant with many subtle manipulators. The metal gate opened, letting the car into the nearest corral.

The robot launched manipulators under the cow's belly. Jets poured into a prepared bucket, fat yellowish milk.

And then the doors of the barn opened wide. Two rosy women bursting with health emerged, one blond and the other one dark. A man of about forty came behind them.

"This, Yerich, I can't bear him anymore!" — was yelling the blond one. — We handed over milking to this mamma-jamma, but I didn't say anything. Then glasses were put on cows — ok, I bear it as well. But to put metal pieces in them …

"And milk due to these innovations is spoiled!" said the chubby dark one.

"What?! Spoiled?!"

"Yey, Tasya-Agatha, shhh!" cut off Yerich. "With a cracking head, I definitely won't solve anything."

He noticed Nika and gave a tired but kind smile. "Let me introduce myself, I am Gregory Andreyevich, executive manager of the Parnetto Dairy Farm."

"Very nice. And can I ask why so …"

"Anxious is the team? You can ask, but not me. Now, expert consultants will drive up, please, listen to them."

"That's right. Let her listen!" Tasya interrupted. "We, you know, worry not because of laziness, but for the enterprise."

"It will be bad for everyone if milk is spoiled!" Agatha blurted out as quickly as if she was afraid that someone would take the next word. "And it has become corrupted as it is!"

Outside, there was a rustling of tires and a quiet creaking of a car brake. Looking out on the street, Nika saw four young people, two guys, and two girls. They briskly walked to the barn. The forward man, seeing Gregory, waved his hand affably.

However, the reaction to the friendliness of the guests was cold. People from buildings and annexes looked cautiously, as if they saw unprecedented animals. Most seemed nervous, alarmed, even angry.

"Are they afraid of something?" Nika asked Gregory.

"Not exactly afraid. A month ago, I modernized the farm and spent lots of money. I tell you. And people are unaccustomed to something new, old and steady always seems better. That's why they are nervous."

Meanwhile, the first of the four young people greeted, "Good morning to the working people! Well, let's start the consultation. If there are questions, please ask!"

Nika cautiously noticed that Tasya and Agatha simultaneously took a deep breath. Judging Gregory's face, he also noticed it.

"First of all, are you a cyberneticist?" Tasya poked a finger at the guy.

"Agro-cyberneticist," he smiled.

"Well then, explain, cyberneticist, why do you put metal pieces into our cows?"

"They're not just metal pieces; they're biosensors."

"They will show when a cow is sick or does not have enough of something or has an infection inside." Tasya nodded.

"That's right," the cyberneticist answered with slight amazement.

"I understand what the sensors are doing. Don't take me for a fool! Explain better what these pieces of metal can do that I don't know."

"Right!" Agatha picked up. "I can recognize any sickness in my cows. I do not miss anything."

"I have no doubt," a girl with attentive dark eyes intervened, "but at what stage?"

"And who are you?" Tasya frowned.

"I'm Eugene, a network veterinarian," the girl was not at all embarrassed. "The program, which we developed with Danila," a nod towards the agro-cyberneticist before continuing, "does not only identify an already active disease but also some dangerous bacteria and viruses in the incubation period that are not noticeable. A person wouldn't recognize them until it's late. Even the most experienced person." She nodded friendly to Agatha. "A program will be able to—"

"Well, are you Danila?" Agatha suddenly changed her subject.

"Well, yes, Danila," the agro-cyberneticist answered cautiously.

"My father was also Danila," Agatha's voice warmed noticeably as if the cyberneticist turned out to be involved in some secret fraternity of people named Danila, members of which, by definition, deserve special trust.

"Uh … good."

"This is somehow confusing," Tasya, on the contrary, did not want to give up her position. "Keep track of diseases that you cannot see. Which, maybe, do not exist at all!"

"Oh, Tasya, stop pressuring Danila," Agatha muttered. "As if I forgot how Natka overate something last summer and died. And you missed it."

Tasya indignantly opened her mouth, about to say something in response. But nothing came up, and she slammed her mouth back and just lifted a finger in the air, as if hinting: well, it still proves nothing.

"Besides," Eugene continued, "the sensors respond not only to critical cases. They will tell you how to balance the animal's nutrition, whether it is necessary to change the conditions of detention. You get extra help with your experience in livestock, that's all."

"And does this monster also help?" Tasya pointed to the robot, which scurried back and forth across the cowshed, making up even rows of milk. "It even scares the cattle!"

"Why do you think so?" Nika could not resist asking. The heads of the milkmaids turned to her sharply, like gun turrets. "I saw milking, and the cows seem to be fine …"

"By the way," Gregory put in, "I have equipped you with a room for evening video lessons. How many of you learn to control robots?"

The milkmaids looked down. Tasya muttered something about poor eyesight.

"Look," the agro-cyberneticist displayed on the screen on the wall of the barn, two graphs. "Here are the heartbeats of Manya when a person milks it. Here is a heart rate when a robot milks it. By the way, information from biosensors remains in virtual memory. You can always track the state of the animal for an hour or even a day if it did not work in person. So, biorhythms, as you see, coincide almost completely."

"Deviations are minor. I specially tuned the robot to the pace to which your cows are used to. What is important to a cow? Repeatability and lack of action stress."

"But what's true is true!" agreed Tasya. "Remember, Agatha, how Zoyka knocked you off a stool? You were sleepy then, barely milking!"

"When was I sleepy while milking?" Agatha flushed.

"It was, it was, you watched this nonsense on Netflix, about American police officers!"

"I want to note," the second guy from the team of specialists intervened, "that your curriculum is not only about robots and their components. Part of it was developed by a group of nutritionists under my supervision. So, you get not only technical skills but also the latest information on how to enrich the nutrition of cows. Better nutrition, richer milk. Enriched milk is better sold. In short, it's all in your own interests."

The words of the nutritionist impressed Agatha, and she seemed to have forgotten even about Tasya's mocking.

Glancing at the entrance to the barn, Nika noticed that the rest of the farmworkers came closer and also listened carefully, even the expression had changed from incredulously anxious to benevolently sceptical. Restrained smirks, it was as if they said to the farmers: "Smart reasoning, shoot! Maybe it's true."

"In general, we cannot explain everything on a napkin," the nutritionist concluded. "Complete information is in the video tutorials. Now, who has any questions?"

"Actually, I have," Gregory boomed. "I understand all this stuff. But why for a month already have I been putting glasses on cows?"

"Virtual reality simulates a pasture. They can see other cows and feel more natural, even when forced to be in a stall. It is more humane."

"Wait a minute, but we're talking about cows." We grow them for food; it's already inhumane. Do your metal pieces change something?"

"Listen, but animals also have emotions," Eugene explained. "And although you have to kill them for food, we can make their life more enjoyable."

"And then, a content cow, probably healthier?" Nika decided to ask a question.

"Nika is absolutely right," the nutritionist nodded. "The less stress the animals have, the tastier and more nutritious their milk and meat."

Gregory thoughtfully rubbed his chin and looked at his cows. Milked, they happily waved their tails, twisted their heads, and tapped their hooves. Apparently, glasses showed them some kind of cow happiness.

"Okay," Gregory finally surrendered. "You are saying; meat is juicier and healthier? Keep the glasses for now and see how this meat is sold in the next six months."

And the owner of the farm extended his wide palm to the men for the farewell handshake.

"Tell me, Danila," asked Nika, when the specialists had already left the barn and headed to the car, "how often do people have such difficulties? Well, with the adoption of the new tech?"

"It happens," the agro-cybernetic nodded. "People are afraid that their experience will cease to be needed. This is an old fear; it has been relevant for ten years now."

"Even more," Nika smiled, remembering her parents and their ideas about 'reliable professions.'

"Well, yes. A robot will replace a person. We will land on the street level… Although, actually, the opposite is true. The more technology there is in production, the more people who can operate it are needed. This is an opportunity to learn new skills. And not only because of the fear of the future but for the sake of increasing salaries!"

As soon as the experts opened the door of the car, a roborabbit smoothly flew up to Nika's foot.

"I wish I could talk about new skills with my parents, right?" Nika smiled at it.

TASK

Come up with similar stories based on the following case, the vision of the future, and list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the room where the characters work be like?

- What conflicts and surprises may arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. Pests attack the cornfi, voracious moths. A drone is required that could recognize the congestion of moths and punctually hit them with pesticides. You also need to calculate the required minimum of pesticides in order to defeat pests, and the environment must not be harmed.
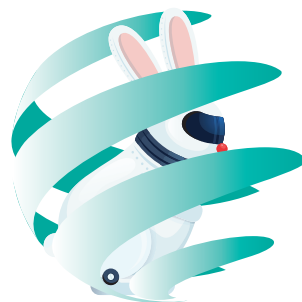
VISION OF THE FUTURE

Earth's population grows, and by 2050, it could increase by another 1.7 billion[*]people. People require more food. So that humankind does not face global famine, as was shown in the science fiction movie Interstellar, the agricultural industry will have to come up with new solutions.

Currently, few people think about the future, and agricultural professions are not very popular, but in the future, their prestige will grow, and the subsistence of mankind will depend on these specialists. In general, there will be less jobs in this sector because of technological innovations that will allow efficient processing of areas using fewer hands. At the same time, the qualifications of those who remain will become higher, and the tasks they face will be much more interesting. Farmers of the future need systemic thinking, developed organizational skills, and knowledge in IT and biotechnology. Farmers will start thinking like innovative entrepreneurs. They will apply new technological solutions that increase the efficiency of their households.

The main threat is climate change, and agricultural technology will have to adapt to possible droughts, floods, and sudden changes in temperature. This can be solved through the creation of genetically modified plants with new characteristics and through the creation of artificial ecosystems on agricultural territories. Despite all the worries associated with GMOs, technology has been researched for over 25 years, and the World Health Organization recognizes it as a safe technology.

The second big problem is soil depletion, which occurs in many regions of the planet. On the one hand, agricultural plants intensively absorb from them those substances that made the soil fertile.

On the other hand, due to the active use of nitrogen fertilizers in agriculture, the greenhouse gas N2O is accumulated in the atmosphere. Moreover, nitrates and phosphates from fertilizers fall into the seas and oceans, violating the ecological balance. Furthermore, the composition of the soil is also affected by pollution

from transport and industrial emissions, as well as waste from mining. And to restore soil fertility, it takes special measures.

Also, according to the Bioversity International research organization, today, three-quarters of the world's plant cultures make up only 12 crops. A decrease in biological diversity increases vulnerability to climate change and pests (imagine, for example, that all the wheat suddenly died in the world. This will produce a coup in the food industry and leave many people starving). So that, if humanity wants to feed themselves in the future, breeders and synthetic biologists will have to adapt existing edible plant species and create new ones.

Pests are gradually adapting to pesticides, and scientists are looking for a way to deal with them using biotechnology. You can think of GM plants that secrete substances, harmful to pests, but safe for humans. Or use the "army," consisting of viruses, bacteria, insects, and worms that are dangerous to specific types of pests.

Even now, in the 21st century, farmers rely heavily on intuition and luck. Due to lack of important decision-making information during the growing process, 40% of the crop is lost.

Automated control systems will help to solve this problem. From using navigation sensors, for example, you can increase the accuracy of planting seeds (for good growth, it is important that the correct combination of landing depth and distance between seeds). Sensors will help organize automatic watering.

Chemical analysis of soil will predict crop yields and plant fertilizers. Using IT technologies, people can monitor the state of plants, calculate by which trajectories it is better to run agricultural machinery in order to save on fuel and process each area faster and receive real-time information about what is happening with the equipment in the field. Automated crop storage allows us to keep track of the volume of the product and manage the microclimate. Russian companies have already started

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[*]   According to the UN forecasts.

creating IoT[*] platforms for agricultural producers, e.g., Rightech and kSense.

In agriculture, drones are also used: they inspect sites from above and collect data for interactive maps, plant seeds, fertilize the soil, protect land, etc. And miniature drones can pollinate plants instead of bees (their number is reducing due to environmental issues). Harvard scientists developed a prototype of such a micro drone called RoboBee. In Russia, several companies already produce agricultural drones. For example, Geoscan and ZALA Aero.

Tractors and combines also become unmanned. For example, Automation Production Association presented at the Innoprom-2019 international exhibition, its unmanned tractor. But you need people for handling drones: to enter map data and program trajectory, as well as for maintenance and repair. Agricultural transport will be equipped with GPS-navigators, computer vision systems, and laser scanning technology (lidar) that helps detect obstacles.

Bosch BoniRob's agricultural robot monitors seedlings and destroys hogweeds doing this mechanically, without the use of herbicides[**]. It is trained to distinguish cultivated plants from "aliens" in appearance. Robots can be used for harvesting, such as the apple picker from AbundantRobotics: it looks like a vacuum cleaner that recognizes and sucks ripe fruit.

Livestock farms already have many livestock care processes automated: distribution of feed, milking, etc. In addition, the physical condition of animals is monitored using RFID tags — microchips that feed radio wave signals with a variety of information — starting with how much time the animal spent on the pasture, and ending with its weight. All data is sent to the cloud, and you can remotely monitor the status of animals and equipment. People are still needed to work here. They remain in the positions of operators and repairmen, as well as for improving farm efficiency, animal health, and reproductive issues (including genetic selection). New technologies allow monitoring nuances important for breeding: appetite information of an animal, its physical condition, the beginning of estrus, etc. Using analytical systems, it will be possible to make optimal feeding diets for each specific animal.

Along with the development of the industry, much attention is paid to environmental issues. Harmful fertilizers and production technologies will be replaced by environmentally friendly alternatives. Agricultural robots and smart systems will switch to energy, sun, and wind. You can also save energy — for example, use multifunctional machines to reduce the number of passes in the field (and burn less fuel accordingly). You can use livestock waste (sawdust and straw) for heating, use the heat of ventilation systems on livestock farms to heat water, set smart climate control, and methane biogas plants to generate additional energy. In vegetable growing, industrial waste (herbage) is also used for heating greenhouses, while rainfall and meltwater are used for irrigation.

In addition, the issue of environmental certification is becoming increasingly important. Now, certification systems are built on audits by accredited auditors. It means that between inspections, there may be abuse, and auditors can turn a blind eye to some problems. IT technologies in this regard are much more objective. For round-the-clock monitoring, you can use nanosatellites, drones, sensors, and all these integrated into a common database for data analysis. Then all risks will be detected in a timely manner.

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[*]   IoT — Internet of Things

[**]   Drugs for chemical weed control.

CROSS-PROFESSIONAL SKILLS

1. Systems thinking

2. Cross-industry communication skills

3. Project management

4. Lean production

5. IT

6. Customer focus

7. Multilingualism/ Multiculturalism

8. Social skills

9. Working in uncertainty

10. Art and Creativity

11. Ecological thinking

AGRICULTURAL ECONOMIST

A highly qualified specialist who monitors the economic efficiency of the agricultural company, helps it to be competitive and adjusts the work of the enterprise for the needs of the market. Also responsible for managing economic enterprise risks. Now, such specialists have graduated from a number of universities, but the need for them exceeds the supply in the labor market.

CROSS-PROFESSIONAL SKILLS
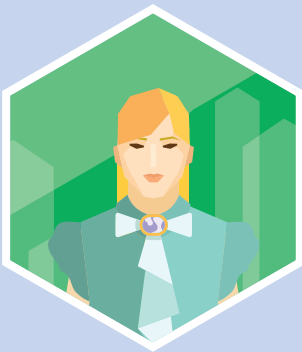
AGRICULTURAL NUTRITIONIST

A specialist developing and customizing individual power schemes for farm animals, which improves the quality of milk and meat.

CROSS-PROFESSIONAL SKILLS

AUTOMATED FARM OPERATOR

Specialist in farm automation technology: sensor systems, drones, and agrobots.

CROSS-PROFESSIONAL SKILLS

CITY FARMER

Specialist in equipping and servicing agro-industrial enterprises on roofs and in the skyscraper buildings of large cities. Vertical farms (autonomous and eco-friendly constructions that allow you to grow plants and breed animals in the city limits) is the story of the near future. The first commercial vertical farm appeared in Singapore in 2012, and now the creation of agricultural skyscrapers is planned in South Korea, China, UAE, the USA, France, and other countries.

CROSS-PROFESSIONAL SKILLS

GMO AGRONOMIST

Specialist in the use of genetically modified foods in rural farms. He implements biotechnological achievements and obtains products with specified properties. Despite the public debate surrounding this topic, most scientists consider GMOs as safe technology, so this profession will be in demand.

CROSS-PROFESSIONAL SKILLS
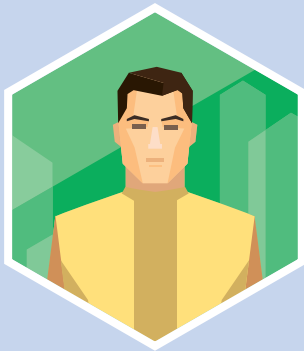
AGROINFORMATICS SPECIALIST / AGROCYBERNETICIST

A highly qualified specialist in the implementation of new technologies, informatization, and automation of agricultural enterprises.

CROSS-PROFESSIONAL SKILLS

ONLINE VETERINARIAN

A veterinarian who works online and, if necessary, travels to small farms or consults online, remotely receiving information about the condition of animals with biofeedback sensors.

CROSS-PROFESSIONAL SKILLS

DIGITAL AGRI-MODEL DEVELOPER

A specialist who creates and manages digital copies of agricultural ecosystems. He or she tracks changes (soil status, illumination, etc.) and controls them to make the most economical use of every resource and get optimal results in the long run.

CROSS-PROFESSIONAL SKILLS

MINING

Nika stood at the high panoramic windows that replaced the walls of the building. Enchanted, she looked down. Wherever she looked, reaching the horizon, was endless forest and birds flying in flocks over the treetops.

"Nika?" someone called out to her, and she turned with regret. In front of her stood a swarthy man in discreet loose clothing. "I am Rustam; let's go. I'll show you everything here."

The building resembled a metropolitan business center, for some reason, built in a small town in the middle of the forest. Bright points glowed on interactive maps on the walls, and most of them were in Siberia. Nika tried to remember what was there. Forests, bears… Oil?

"I am so glad that you decided to follow in the footsteps of your uncle," Rustam said. "Meanwhile, geology is experiencing a new renaissance. There are so many opportunities!"

Yeah, Nika thought. *So, it's not bears.*

They went into the office with a dozen computers, monitors, and all kinds of sensors and lever arms. The girl's head was spinning from the rapidly changing images on the screens. On one, endless forests and rivers from a bird's eye view; on another, incomprehensible mechanism spinning around its axis; on the third, colorful numbers running, as in the Matrix.

"Of course, choose it yourself," said Rustam, looking around the control room, "but I think that it's best to go with a focus on the coordinator of distributed tunnelling teams. This is what I do." He smiled. "Here, you will try everything at once. It is necessary to understand the geology and be able to get along with people. My task is to coordinate people there, at the place of extraction, and here in the center."

Nika looked around, and there were a dozen people in the study. "Are they all geologists? But how can one work from here when the field is there?" Nika was surprised. "You don't see anything; you don't know what's there. It's far away!"

"It's not that far," the coordinator grinned. "Just twenty kilometers from the city. But, theoretically, they could be controlled from the other end of the Earth. Both people don't suffer, and it's better for nature as well. Look." He pointed to one of the screens. A camera just flew over the field by the river. "So many birds! And they're not afraid of anything, and less affected by pollution. People still litter so much."

"Tell this to Vasilich," the white-haired girl laughed at the computer. "He is a mechanic, repairing robots at the place."

"I also need to coordinate people with him. And with eco-analysts, constructors… You can't do anything without a coordinator!"

"Oh, tell us," the white-haired snorted. "Everything starts with us. With IT geologists, in a sense. Until we create a model for you, no one will be able to work."

"You created, and what?" cut in a large man with a beard. "The situation is changing. You need to constantly check the data, track, analyze, warn on time. So, everything rests on telemetry data and engineers, interpreters of this data."

"Bored," the chubby woman stretched out, sitting at the controller. She nodded to Nika, pointing at the screen. "Better look at it," she moved the lever, and the image changed, an invisible camera soared into the air. "The coolest job is being a UAV operator. And it's beautiful and interesting, and without our data, not one of these clever men would matter."

"Are you serious?" the tall, lean man rolled his eyes. "Argue on which of you is cooler? Come here and look at the real cool," he beckoned to Nika. "Robotic systems engineers control the whole complex. While they play with toys, we produce oil using new technologies. Heard about the insitu combustion method*?"

Nika shook her head.

"And I work with it… It's not you who invented it, but the engineer for the implementation of the EOR." said the UAV operator in an innocent voice.

"And you work relying on my data," the engineer-interpreter said.

"And you rely on my model," the IT geologist added.

"But I do everything with my hands!" the robotic engineer exclaimed irritably, bent over the keyboard, and banged on it. "I will show you something now."

A bright red window flew out in the screen, but the man immediately closed it.

"And is there anything important?" asked Nika.

"Yes, we recently drilled. Now, the system is signalling that traces of methane are in the oil trap," the robotic systems engineer blurted. He chuckled, noticing how the girl's face got stretched. "Do not be afraid. The system is constantly signalling. It reacts even if there are hundredths of a percent. Better look here." He clicked on the start button and spun on the 3D model screen. "You see where the arrow went?" the man poked into the monitor.

"This program shows that the stove has already evaporated water, and steam is under pressure going into the well. It heats the oil. It will become more fluid, and it will be easier to get it."

Nika approached the monitor to see the process better, when all of a sudden, the alarm went off from all directions. A bright red warning tapped the screen: "Leak of gas detected!"

"Oh, there's a warning again," Nika said, but this time the man didn't grunt.

"Get out! Guys!" He rushed to the monitor.

The team was already set in motion. Looks became attentive, and fingers pounded keys.

"Methane leak," the telemetry engineer threw in. "Gas concentration trapped in oil is 2.5% and growing."

"And what does it mean?" Nika asked, confused.

"That soon, everything will explode," the coordinator said quietly. "5% and the explosion may happen at any moment. Gas leaks to the equipment, one spark — and the installation comes to its end." He grabbed the phone, pressed it to his ear. "Vasilich," he spoke fast, "urgent evacuation, quickly. No, I'm not joking! Red code."

The robotic systems engineer scanned the data on the screen. "What's the hell? Where is the gas from?"

"It must be a crack after drilling," said the coordinator. "You have a warning on the screen!"

"3.3%!" the telemetry engineer exclaimed, constantly watching the numbers.

---

*　　Find more on this method in "Vision of the future".

The coordinator swore quietly and rushed to the IT geologist.

The woman unfolded a 3D model on the screen and highlighted the desired area. "There is a chance," she said.

"A chance?" Nika squeezed.

"Launch the H-19 protocol," said the coordinator to the robotic systems engineer.

"If the systems manage," he turned to Nika, "they pump gas out of the well."

"And if not?"

No one answered the girl.

"3.7% … 4.2% …" voiced the telemetry engineer.

"Come on, come on," the coordinator whispered. The IT geologist covered her mouth with hands.

"So many animals will die!" exhaled the UAV operator.

"Why?" quietly asked Nika.

"Oil will get into the Ob river," the coordinator replied.

"5.5%!"

People froze, silently looking at the screen. Nika understood that if an explosion occurred, then somewhere, it was very far, but subconsciously she was waiting for the roar.

"5.4%," the telemetry engineer exhaled. He tapped on the keyboard, rechecking the numbers, and repeated, "5.4%! No, already 5.3%!"

"It is going down!" Nika exclaimed.

"4.1%, 3.6%, 2.2%, 1% …" the telemetry engineer continued. "Everything is clean," he finally said, and only then did everyone exhale for real.

"Quite a good shake," the IT geologist laughed nervously.

The coordinator walked away to tell the good news to the mechanic, and when he returned, Nika was already waiting.

"I thought geology wasn't so dangerous," Nika shook her head.

"There's more to that," the coordinator grinned. "My great-grandmother travelled around fields in Siberia at 50 below zero, that was the real extreme!"

TASK

Come up with similar stories based on the following case, the vision of the future, and list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

● How many different specialists do you need to complete a task?

● What might the room where the characters work be like?

● What conflicts and surprises may arise during the course of work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. It is necessary to explore the subsea field in the Kara Sea, to drill exploration wells, conduct research and, based on them, create a digital model of the deposit on which development options will be tested. Also, you need to assess the environmental risks of developing this field. Tip: Specialists from the Water Transport industry will come in handy.

VISION OF THE FUTURE

Russia is one of the richest countries in minerals, and therefore, mining and mineral processing is very important for its economy. In the coming decades, demand for minerals will remain high, and the need for highly qualified personnel in industries will remain. And yet, professions will change under the influence of new trends and technologies.

First, traditional deposits of oil, gas, and other resources are depleted, and mining companies are forced to move to increasingly complex fields. After using primary (when the flow of oil is ensured by natural forces) and secondary (using water or gas injection) extraction methods, up to 60% of oil reserves remain in the fields. Therefore, experts are developing more effective methods of enhanced oil recovery (EOR): thermal exposure, injection of chemicals based on surfactants and/or polymers, injection of hydrocarbon, flue gas, or carbon dioxide, microbiological method, etc.

The most effective and environmentally friendly are thermal methods. They allow bringing the oil recovery coefficient to 80%. Thermal methods are mainly used for deposits of high viscosity oil with complex geological, physical conditions. The most common thermal method is the method of in-situ combustion. It implies in the fact that part of the oil inside the reservoir is burned under strict control, and from heat, the remaining oil liquefies, and better goes to the surface. This method requires an integrated approach with thorough research. Physicochemical and thermodynamic characteristics of the process in conditions as close as possible to the actual conditions of the field.

There is also a transition to new types of resources, such as oil sands, shale gas, offshore and deepwater fields. Deep-sea ocean production will be relevant not only for oil and gas but also for industrial mining of ferromanganese ores and other metals. Back in the 1970–1980s, oceanographers found that there were many deposits of polymetallic ores on the seabed. Moreover, the content of metals (including gold) in them is much higher than in deposits on land.

In the spring of 2018, Nautilus Minerals began industrial development of the Solwara 1 field in the Bismarck Sea. To pick up ore from water to land is an expensive and time-consuming task requiring advanced technology (career robots with remote control, vertical ore lifting system and draft and auxiliary ships) and accurate calculations.

Secondly, there are increasing requirements for environmental friendliness of production, environmental protection when transporting minerals, and when closing deposits. An example of promising environmentally friendly technology already in use is a collection of mined methane in a pipeline so that gas is no longer emitted into the atmosphere. Biotechnological solutions come to the industry, for example, cleaning rocks with bacteria.

Two other important trends are the reduction in energy costs for production and economical resource usage. For example, coal mine methane contained in coal seams and the surrounding rocks can be liquefied and used as fuel. First of all, this technology is useful for domestic production needs — for example, refueling dump trucks and lighting structures. The technology is especially relevant in climate-difficult places of development where shift or uninhabited method of work is used.

Work will increasingly be remote. Now, fewer specialists are ready to move to the production sites. Mining is the industry with high risks for employees; therefore, technologies are actively developing, ensuring production safety for people. Therefore, unmanned technologies will be increasingly introduced, and employees will begin to work remotely in virtual teams and telemetry systems. In some cases, production with a minimum of people and a lot of technology, making up for their absence (for example, remote medicine) will be introduced. At such facilities, there will only be shift workers.

The so-called smart fields are created — high-tech complexes that allow more accurate and careful control of the production process of hydrocarbons extraction. Smart fields include mining automation, remote access to equipment, data collection, and analysis of all ongoing processes, as well as methods of increasing

work efficiency at all levels. One of the most important aspects here is flexible distribution and detailed electricity metering, allowing to reduce energy costs. The system includes automatic security systems.

In addition, there are increasing opportunities for short-term forecasting and modeling of mineral extraction processes. You can create a three-dimensional digital model of an oil field, simulate flow in reservoirs, and predict production efficiency under different development scenarios, based on mathematical physics equations. Therefore, during exploration and drilling, a large amount of data is collected to build the most accurate model.

First of all, the data of seismic studies, geophysical and hydrodynamic studies of wells, as well as well logging (making detailed records of a well section structure with a geophysical probe). Machine learning methods help optimize the operation of equipment, automate the construction process geological models, creating rapid screening systems for development options deposits.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

COORDINATOR OF DISTRIBUTED TUNNELLING TEAMS

A specialist whose task is to ensure a coordinated interaction of people, part of which is located directly at the facility, and some are involved in the project remotely. His or her key tasks are the setting of work tasks, the organization of communication in a team, the removal of contradictions and conflict situations.

CROSS-PROFESSIONAL SKILLS

EXPLORATION UAV OPERATOR

A specialist who monitors the development of the field and is looking for new deposits using unmanned aerial vehicles equipped with magnetometers and other geophysical sensors. Drones analyze promising areas, conduct geodetic surveys, survey production objects that recognize the presence or absence of individual means of protection on person, confirm the correctness of the work performed, etc., UAVs are already used in mining by China, the USA, France, Germany, Poland, and other countries. And in 2017, Gazprom Neft used UAV to deliver the cargo to a remote field for the first time.

CROSS-PROFESSIONAL SKILLS

ROBOTIC SYSTEMS ENGINEER

He or she serves automated systems for monitoring, development, production, and processing and managing of mineral deposits.

CROSS-PROFESSIONAL SKILLS

TELEMETRY DATA INTERPRETATION ENGINEER

This specialist analyzes the array of data coming from the field to monitor the process, anticipate possible emergencies, and make prompt decisions if necessary.

CROSS-PROFESSIONAL SKILLS

MINING SYSTEM ENGINEER

A specialist who works with natural resources on a full life cycle (from exploration to closure and remediation of deposits), taking into account the complexity of these facilities. For example, in the same territory may be deposits of both oil and gas, and it is necessary to harmoniously combine fundamentally different technologies for the extraction of these minerals.

CROSS-PROFESSIONAL SKILLS

IT GEOLOGIST

A specialist who, based on an array of information collected, creates a digital model of the field and works out different production scenarios on its minerals. He or she combines skills in geology and seismography with skills in programming, machine learning, and 3D design.

CROSS-PROFESSIONAL SKILLS

SMART FIELD SYSTEMS CONSTRUCTOR

A specialist who designs and improves automated systems for smart fields. On the one hand, he or she combines technical knowledge in mining and robotics; on the other hand, understands production processes well and knows how to optimize field management.

CROSS-PROFESSIONAL SKILLS

EOR IMPLEMENTATION ENGINEER

A specialist who helps move to the advanced enhanced oil recovery (EOR) methods. He or she calculates which method is best for a specific field and what equipment and specialists will be needed for its implementation.

CROSS-PROFESSIONAL SKILLS

DEEP-SEA GEOLOGIST

A professional who is engaged in the exploration of deep-sea deposits, plans to develop them, collects information to create digital models, evaluates the prospects of the field and the complexity of mining useful fossils.

CROSS-PROFESSIONAL SKILLS

ENVIRONMENTAL ANALYST IN EXTRACTIVE INDUSTRIES

A specialist who analyzes, prevents, and eliminates environmental threats in the mining process and helps restore environmental balance at the final stages of production. The most common pollutant substances during hydrocarbon production are actually hydrocarbon compounds, oxide, nitrogen, hydrogen sulfide, and sulfur dioxide.

CROSS-PROFESSIONAL SKILLS

LNG EQUIPMENT OPERATOR

A specialist who services equipment for production and transportation of liquefied natural gas (LNG), refueling facilities for ships. LNG is natural gas, cooled after purification, and turned into liquid. It has low toxicity and takes up 600 times less volume than ordinary gas. LNG use is now replacing naval fuel oil for shipping and eliminates the risk of accidental oil spills, making shipping economically and environmentally attractive. In such remote areas like the Russian Arctic, LNG could become one of the key types of energy supply in the near future.

CROSS-PROFESSIONAL SKILLS
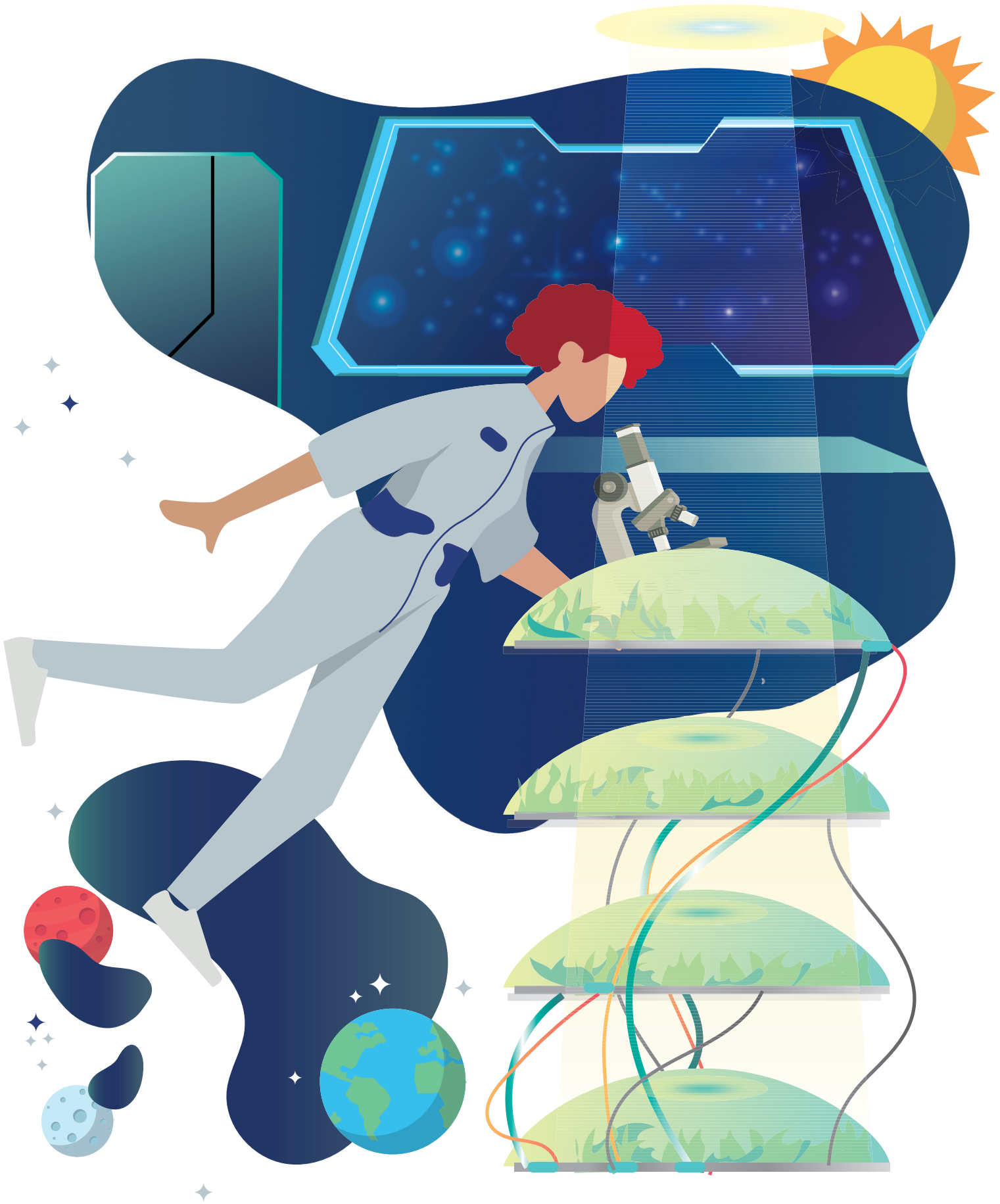
SPACE

The roborabbit disappeared, along with its long ears that a moment ago clasped in Nika's hands. Only then did the girl realize that she was squeezed in a tight space, as if in a bath perfectly adapted to her size, to the bottom of which she was pressed by the belts. Bent legs, neither turn properly nor breathe. It was dark around, but it seemed to her that the bathtub or even the whole space was moving. Nika did not have time to check for sensations as the thing jerked and froze.

"The docking was completed successfully," a mechanical female voice came from somewhere above, and the light came on.

That's great, Nika thought. She tried to turn, but her body moved awkwardly, in uncomfortable tight clothes.

No, not even clothes …Suit! A real spacesuit.

The girl began to look around. She was fastened to the seat with really tall sides, resembling a bathtub, on both sides of which there was another seat like hers. On top of them was a metal dome, so low that it caused that sick feeling in her stomach.

"How do you feel?" a woman bent over her, dressed in the same awkward spacesuit. "Is your head spinning, isn't it? Not sick?"

"I'm … fine," Nika stopped abruptly, noting that the woman was not actually bending over rather, she was hovering over her. Well, no, the roborabbit couldn't throw her into space!

"Then let's get out." The woman unfastened the belts around Nika. The girl soared up, but the stranger held her. "Don't worry," she smiled. "You will get used to it soon."

She nodded to the man floating around the hatch. He pressed the panel, and the hatch opened. They passed, or rather floated, through a metal tunnel. It was difficult to move around: the slightest movement pushed her aside, and Nika seemed to beat every section of the tunnel. Finally, the second hatch opened, and noise hit her ears, as if from a nearby passing train.

Nika frowned and jerked her head. Her head buzzed, vision was blurry, but in one thing, the girl was sure that this small room, laden with some appliances, twisted with wires, could not be part of the space station. It's too cluttered.

Where are all these passages and white walls that were shown in the films?

Her fellow travelers had already managed to take off their spacesuits and turned out to be a pretty woman with spiky red hair and a dry brown-eyed man with Asian features. The redhead floated to Nika and helped her get out of the suit. No sooner had the girl removed her helmet than in her nose musty smells hit, and the noise became even stronger.

It's more like a plant, not a space station!

"Welcome," two men floated out to meet them, so dissimilar that it seemed intentional. A large Afro-American astronaut held out his hand to the brown-eyed man. "How glad I am to finish my shift!"

"I can't believe that it takes just three hours to fly home," a white-skinned blond picked up.

Both of them spoke languages unknown to Nika, but the translator in the ear obediently translated.

"And I, on the contrary," the woman smiled, "can't wait for work in the field. I am an astrobiologist," she explained to Nika. "And so far, everything has been purely theoretical. Finally, I'll see how my rabbit food reacts to zero gravity."

"What's the difference?" asked surprisingly Nika. "You still give them light and water."

"Well, there is no gravity! Its absence affects metabolism and leads to genetic changes.

And the roots! Normally they grow down due to gravity. And how do they behave in weightlessness? Finally, a completely artificial environment also affects them."The Afro-American astronaut led them to the ship.

"We are now in the working compartment of the Star module," he said, turning to Nika. The girl looked through the windows and got stupefied. Only now did she realize that she was in space.

"Beautiful," the woman whispered. The brown-eyed nodded dryly and headed for the dash panels. He glanced around the screens and sensors. "Is everything okay?"

"So good that you will pray for the smallest situation," the Afro-American man muttered.

As if on command, a mechanical voice came from above: "Danger of collision. Danger of collision."

The men examined the screens and Nika instinctively cringed.

"Asteroids?" She asked in a whisper.

"Asteroids? No!" waved the brown-eyed. "Usual garbage."

"Garbage?" Nika immediately relaxed, but the rest remained serious.

"This is not a joke," the woman shook her head. "Even a bolt flying off is capable of drilling a hole in the casing. After all, it moves at the speed of eight kilometers per sec!"

"Will you allow me?" brown-eyed jokingly turned to the Afro-American guy. He shrugged, and the man leaned over the dashboard.

"And what are you doing?" Nika floated closer.

"I changed the trajectory to go around this nut. Voila! Perfect…"

"ISS-128," the speakers came to life again, but this time, the voice was human and tired. "ISS-128, copy."

"Copy that, Korolev," the brown-eyed answered. "We are in place, and everything is in order."

"A tourist," he turned to Nika, "also seems quite fine. She's just a bit green."

"Why the hell are you talking about the tourist?" the dispatcher muttered. "You have a garbage stain ahead of you."

"Thanks," the brown-eyed grunted. "Already gone around it."

"You haven't gone around it," said the dispatcher gloomily. "A cluster is almost 30 thousand kilometres from us, hundreds of debris with a diameter of more than ten centimeters. The risk of Kessler syndrome."

The astronauts looked at each other.

"What does it mean?" frowned Nika, seeing how their faces got stretched.

"That there is so much garbage that a chain reaction can start," the astrobiologist answered quietly. "Garbage smashes satellites and stations, there is more and more garbage, so it breaks everything in the orbit.

"I gave you a new trajectory," the dispatcher continued. "It minimizes collision damage. Can you turn on the garbage collector?"

"Yes," the brown-eyed answered. "I'm a robot pilot." He frowned and began to type quickly.

Among the already familiar noise, another stronger one came, and the station shuddered.

"Look," the woman whispered to Nika. "You can see it flying on that screen." When it gets to the trash, it releases the network and collects everything like fish in the sea.

Nika remembered her adventure with the coelacanths at the ocean station. Good, that is in space, at least there are no sharks.

"The garbage collector has disconnected," the brown-eyed reported. "Have you already turned on the main garbage collector?"

"We …" the dispatcher suddenly hesitated and muttered to the side: "Yes, wait!"

A fuss was heard, and another high and frightened voice came: "Good afternoon! I would like to talk to Nika."

"I'm here," the girl squeaked.

"I'm your personal manager for space tourism, and on behalf of the company, I'd like to say that we are terribly sorry that you have to face difficulties. But don't worry! We were assured that the station has safe shelters. At the slightest suspicion of danger, we will immediately lead you there. The safety of our guests is our highest priority!"

He wanted to say something else, but judging by the sounds, the dispatcher managed to take hold of the microphone.

"Damn businessmen," he muttered.

"You spoke about the main garbage collector," the brown-eyed recalled. "Are there any problems with it? As far as I remember, it should be nearby."

"It's busy with another task," the dispatcher said reluctantly. "And in order to redirect it, a few issues have emerged … Legal ones. But don't worry, a space lawyer is already working on it.

"Why do we need your lawyer?" The astrobiologist muttered. "Why is there no garbage collector?"

"This afternoon, India blew up its satellite. Without any notice for the International Space Union and, of course, without its permission. They violated the International garbage and space safety convention, and the garbage collector is already busy with another task." He fell silent, waiting for a response, but the astronauts were silently shocked. "Don't worry. We will deploy the garbage collector. But the fact is that it costs money. India refuses to pay now or ever in the future, and the question is … well, don't worry. We invited Nesbe, and he'll figure everything out."

"The lives of people are at stake and the death of the entire program, but they care about money!" the brown-eyed man exploded. "And what should we do?"

"First, calm down," the dispatcher answered. "And second, evacuate to the Soyuz units. You have a tourist on board, do not forget."

The brown-eyed nodded. He commanded, "Me with Natasha and Nika will hide in the Soyuz MS-43, you are in the Soyuz MS-17M.

"Why do we split up?" asked Nika anxiously.

"Soyuz units are the safest places at the station, but there is not much space in them. Come on!"

The brown-eyed floated forward, showing Nika the way. The astrobiologist smiled encouragingly at Nika.

They put on their spacesuits, which they recently took off and returned to the ship. But at least, the girl had not yet been forced to climb back into the bathtub.

"Is everything good?" asked the brown-eyed man on the radio.

"Ok, cap," the Afro-American astronaut answered. "To tell the truth, I was hoping to be home."

He sighed. "Do you know what I miss most?" My wife? Daughters? No! My normal bed, where I can sleep and feel firm ground," he laughed and turned to the side: "And you?"

"A bed, no!" a white-skinned voice came from the walkie-talkie. "Shower, just a normal shower!"

"I'm sure everything will work out," said the astrobiologist. "Nesbe is one of the best lawyers, works for the UN, and is not politically engaged. He figured out a territorial conflict on Nerea. The US demanded that Japan desist from digging the asteroid. Like, they arrived first, and due to it, the asteroid belonged to them. Nesbe proved that their claims were without any legal ground. So, he also managed to get amendments in the International Space Union."

"If the ISS explodes, not only will we suffer," said the brown-eyed gloomily, "there will be so much garbage that, until it is collected, years will pass, and the program will be put on hold."

There was an explosion, and a howl of systems cut through the silence.

"A hit in the casing of the station has been registered." said a mechanical voice calmly. "A hit in the casing of the station has been registered."

"Hey, are you okay?" asked the brown-eyed everyone.

"Yes," Nika answered simultaneously with the astrobiologist.

"Yes," came out of the radio.

"Has it … started?" Nika asked quietly, but the brown-eyed shook his head, pulled out a tablet, and began to check the system data.

"No, a single fragment. So far, everything is normal. Although …" he leaned over the tablet. "Shoot. The integrity of the casing in the 'Quest' is damaged. Depressurization in progress."

"I get it. I'm going to fix it," the astrobiologist nodded.

"Why you?" asked Nika.

"I am also a specialist in extra-ship activities. Overboard problems are my problems," the woman grinned.

"Even at the station, it's not safe," the brown-eyed shook his head. "And in the open space when there is debris …"

"We can't leave it like that, you know."

"Yes. Be careful and keep in touch; we will let you know if we detect trash. And tell us about everything you do!"

"You'll get tired of me," the astrobiologist snorted.

When the hatch closed behind her, tension hung in the ship.

"Float to the exit," came the woman's voice. "It's boring here and no garbage. I get out, and maybe it will be more fun there."

The brown-eyed guy's face froze while the astronaut described how she was going into outer space, clinging to the fasteners, getting to the crack site, and closing with sealant.

He listened and inextricably followed the devices, whether a new chip appeared on the screen, but everything was clean.

"I'm inside," the astrobiologist finally said, and the brown-eyed exhaled noisily.

"Come here quickly," he said, but the relief was read on his face.

"Soyuz 128," the dispatcher said out of sudden. "Soyuz-128, copy."

"Copy that, Korolev." responded the brown-eyed.

"The garbage collector got deployed, and is moving towards you."

"Will it manage?"

"Yes."

Nika waved her hands in joy and immediately floated back to the wall of the Soyuz. She hoped that now they could return, but had to wait for other endless hours, while a voice from somewhere on Earth would say that everything is calm and they can get out.

"But first, somebody wants to talk to you …" something rustled, the dispatcher's voice disappeared, and in his place arose another, already familiar high voice of the space tourism manager.

"How glad we are that everything is alright with you!" he chattered. "We have only a few minutes, but we would like … No, we demand that Nika be sent back to Earth as soon as possible. Exposing her to further danger is simply unacceptable!"

"There is no danger anymore," the brown-eyed said dryly. "The crew with Nika will be back tomorrow. And if you really don't want to put the girl at risk," he raised his voice as the manager tried to protest, "you won't boil over it. Everyone is tired, exhausted. Tomorrow they'll set off with a clear head."

He turned to the crew and smiled at them: "Well, everyone, time to sleep. Come, Nika, I'll show you to your cabin."

"Two seconds!" she said, noticing ears sticking out of entangled wires appliances. "I have one very important matter."

"To tear off someone's ears for such an adventure," she finished in her mind.

TASK

Come up with similar stories based on the following case, the vision of the future, and list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

● How many different specialists do you need to complete a task?

● What might the room where the characters work be like?

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Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. It is necessary to build a base for astronauts on the Moon (not designed for long-term accommodation, only for short-term missions). The base will need a life support system, radiation protection, energy sources, and a device for communication with the Earth.

VISION OF THE FUTURE

Mankind mastered flying on vehicles heavier than air at the border of the 19th and 20th centuries. Visionaries and outstanding scientists — Tsiolkovsky, Goddard, Langley, Korolev, and many others — created visions of the future and technologies that can support these visions from the very first days of the development of aviation.

At the same time, in the 20th century, we learned a lot about the history of the Earth: mass extinction of species due to various reasons, including an asteroid impact, clearly showed humanity that life on the planet is closely related to what is happening beyond it. This awareness prompted the exploration to space. Serious applications for space technology on Earth were found very quickly — such creature comforts as GPS, digital cameras, teflon, solar panels, and many more were invented, thanks to the space industry.

In this second wave of space technology development, fully automated systems that can operate without human control gain more and more importance. Scientific missions set off farther from Earth, and gradually across the solar system there will be a distributed network of spacecraft, collecting and transmitting data, and then getting engaged in the production of new parts in orbit, mining, maintenance of other spacecraft. As robots will explore space, the conditions for the arrival of people will appear. At lunar and space bases, living conditions will be created: artificial gravity based on centrifugal base rotation forces around its axis, air and water treatment systems, food cultivation, etc.

Spacecraft will begin to work fully without human control. Space telescopes and sensors, which are already in small numbers in orbit, will become much more common and will go deeper into space. Accurate maps will be required for stable operations of the interplanetary space network. The same devices will analyze asteroids, comets, and other objects potentially dangerous to humanity. AI, sensors,

and algorithms will allow them to evaluate the situation in the surroundings, share data, and make decisions. Remote sounding tools are being developed, allowing to solve new types of problems. For example, there are already prototypes of infrared cameras that better detect fires on earth from space and assess the condition of agricultural fields.

Interplanetary Internet will appear with new automatic protocols routing, when each device not only collects and transmits its data but also serves as a communication center transmitting data from other devices. This network will be decentralized (even though most of the data will still get to the Earth) and self-organizing, according to P2P* principles, which allows reliable data transfer even in conditions of changing orbits, unplanned breakdowns, failure of network nodes and other circumstances.

In addition to conventional spacecraft transmitting their data on the space network, specialized communication devices will start transmitting huge amounts of data over long distances. Radio does not allow the transmission of a lot of data. Besides, there are no free frequencies near the Earth right now, so laser or other optical connection, communication is indispensable.

A whole class of service vehicles will appear that will be refuelled by satellites, tow them for repair and processing, repair in orbit, etc. But most likely, the first task of such satellites will be to clean space debris — in orbit, tens of thousands of failed objects are already flying. In the event of a satellites collision, a huge amount of debris can be formed — so-called Kessler syndrome: a situation where the debris of some satellites crashes into other satellites. This creates even more debris, and ultimately, the entire orbit can become unusable. (This risk is clearly shown in the Gravity movie.) There are no solutions yet, but NASA, and ESA (European Space Agency), and a number of private companies have begun working on them.

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* Peer-to-peer. It is a decentralized computer network based on the equality of participants. Since any node in it is both a client and a server, it is more stable than an ordinary centralized network, where the failure of any server immediately disrupts work.

With the advent of private astronautics, the rocket carrier market began to develop markedly faster than at the end of the 20th century. Progress in this area will continue, and there will appear relatively inexpensive serial, carrier-assembled rocket launchers, oriented to the delivery of goods beyond the limits of the Earth's orbit — to the Moon, to the belt asteroids and other places in the solar system. Ultralight rockets will also get developed, including returnable reusable rockets for operational shooting from low orbits that can be launched to respond to emergencies. These ultralight missiles will be more accessible, and competition will increase as already in the USA and Europe, amateurs, rather than professionals, like the Russian CanSat movement.

As they go beyond the orbit, technologies are developed that are ineffective in atmospheric conditions, but productive in space: for example, ion engines* and solar sail**. And, despite the development of the rocket industry, spacecraft will still be too expensive to launch from Earth — the bulk of the rocket is the weight of the fuel that it carries. Therefore, they will begin to appear, albeit very slowly, methods for the production of parts and assembly of vehicles in space: metal mining from asteroids (studies of astrophysicists show that in the composition of the rocks of comets and asteroids, iron, gold, nickel, platinum, and other valuable metals can be found), the production of fibre materials for the construction of planetary bases (for example, base on the Moon or Mars is built from fibre created in place from dust and rock, which does not need to be transported from Earth), production and processing of satellites, 3D printing technology with metal in vacuum and zero gravity, microcircuit technology and electronics in space conditions.

Also, rare and expensive for the Earth production sectors will be developed, under the conditions when an object is produced in orbit sent it back to Earth, when it is difficult or impossible to produce it under the forces of

gravity: materials of a very high degree of purity, without gravity-induced defects, drugs, organ-bio-3D printers, energy-intensive production (due to more intense sunlight, not dissipated by the atmosphere, solar panels in space produce more electricity). It will take a lot of energy to provide all of these systems.

First of all, solar cells and compact nuclear sources will develop fast, but also other sources, such as helium-3, which is found in abundance on the moon. In the long run, even the extraction of helium-3 on the moon is likely for further delivery to Earth to provide energy to earthlings (this is described in the movie "Moon 2112").

Technological chains for the creation of satellites, rockets, and spacecraft will be distributed, narrow specialization and expertise will deepen. Some companies (and even entire countries) will make optics for satellites created around the world, others — power systems and batteries, and some, radiation-protected microcircuits, etc. The creation of a spacecraft from a piece of laboratory work will turn into a conveyor for the production of standardized modular solutions. Based on such standards, conveyors will be built for the production of serial satellites, and this work has already begun by large private players (SpaceX and Amazon). Large space agencies (NASA, Europe, Russia, China) will continue to control the process, but an increasing part of the production will be concentrated in the hands of private or organizations not fully affiliated with the state. A device assembled in international space according to international standards, especially, will be difficult to attribute to any country. Only ownership issues will remain (or equity) and intellectual property collected in orbit apparatuses.

Of course, all this activity will need to be regulated. Today, there is only one key international organization that regulates the work spacecraft: ITU (International Telecommunication Union), which distributes frequencies for transmitting data to the Earth between

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* These rocket engines use ionized gas, which is accelerated to high speeds in an electric field — this creates jet thrust. It consumes little fuel and runs for a long time, although its thrust is less than that of conventional jet engines.

** A sail that uses a photon stream as wind. Electromagnetic radiation incident on the surface of the body exerts very little pressure on it, but in a vacuum, due to the lack of resistance air, it can be used to move satellites and other objects.

government agencies of different countries. In the future, independent international institutions will appear that will regulate all issues of space exploration: distribution of orbits, garbage removal from orbits, mining, production, construction of space and planetary bases, and everything else. The institutes of insurance of launches and work in space will also be developed, and legal support of space activities will be worked out on international law on the delineation of outer space, taxation of value-added products created in space, and much more.

When humanity does try to live in space and on other planets, we will need a full-fledged life support system in space: oxygen recycling, water purification, food cultivation, etc. Not a single case of creation of a fully autonomous system was there, except for ground experiments (the most famous is "Biosphere-2"*).

The other two equally important tasks are research, and the creation of artificial gravity and protection from cosmic radiation, which is outside the magnetosphere of Earth is even tougher than on the ISS.

These three areas of development will determine how space homes will look in the future, in which astronauts will be able to stay for a long time and without the constant support of the Earth. Such places will become the basis of space stations, bases on the Moon, Mars, and other facilities.

In the next twenty years, one of the most promising development areas in the space industry can become space tourism. It is unlikely that a person will be able to independently organize a tour and go there as a "backpacker" that's why the profession of space tourism manager will be in demand.

Blue Origin and Virgin Galactic offer suborbital flights**, and Space Adventures has already delivered eight tourists to the ISS. Simpler flights to the stratosphere are also offered, with the ability to spend a minute in zero gravity. Space tourism remains entertainment for the rich, but with the cutting of prices on space flights, it will become available to many, as it happened with air travel at some point.

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* A long experiment of American scientists living in a closed artificial ecosystem, built in the Arizona desert.

** Flying outside the atmosphere, but without going into Earth's orbit.

CROSS-PROFESSIONAL SKILLS

1. Systems thinking

2. Cross-industry communication skills

3. Project management

4. Lean production

5. IT

6. Customer focus

7. Multilingualism/ Multiculturalism

8. Social skills

9. Working in uncertainty

10. Art and Creativity

11. Ecological thinking

SPACEPORT ENGINEER

Specialist servicing the near-Earth transport network and responsible for the development of corridors of traffic flows (both flights to orbit and ballistic flight transcontinental flights) and synchronization launches on earth.

CROSS-PROFESSIONAL SKILLS

ASTROGEOLOGIST

A specialist who is engaged in the exploration and mining of minerals on the Moon and asteroids. The American company, Planetary Resources, has already released several generations of satellites to search for water on asteroids (this is the main resource needed both for life support and for the production of hydrogen fuel). And in the Colorado School of Mines already there are space mining educational programs.

CROSS-PROFESSIONAL SKILLS

LIFE SUPPORT SYSTEMS ENGINEER

A specialist in the maintenance of life support systems in complex conditions.

CROSS-PROFESSIONAL SKILLS

ASTROBIOLOGIST

A specialist who studies the behaviour of various biological systems (from viruses to animals and humans) in space (in spaceships, on planetary stations, etc.), studies the physiology and genetic changes of organisms, develops sustainable space ecosystems for lunar orbital stations bases, and long flights.

CROSS-PROFESSIONAL SKILLS

SPACE TOURISM MANAGER

A specialist who develops programs for visiting the outer space, and subsequently, orbital complexes and other space structures (including lunar bases).

CROSS-PROFESSIONAL SKILLS

SPACE CONSTRUCTIONS LIFECYCLE DESIGNER

A professional designing space structures (stations, satellites, etc.) with considering future restructuring and disposal. Demand for these professionals will arise in the coming years due to more intensive development of circumterrestrial space and the resumption of plans for the colonization of the Moon and Mars.

CROSS-PROFESSIONAL SKILLS
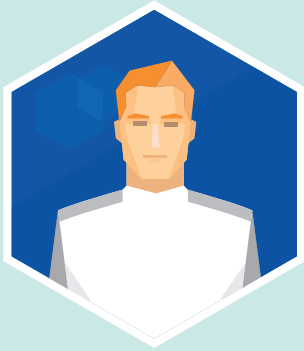
RESEARCH EQUIPMENT DESIGNER

A specialist who designs probes, sensors, telescopes, cameras, and more research equipment for working in far space.

CROSS-PROFESSIONAL SKILLS

SPACE GARBAGE COLLECTOR

The operator of the service equipment, which will initially be engaged in cleaning space debris, and then he or she will take on other functions, including refueling, repair, etc.

CROSS-PROFESSIONAL SKILLS

COMMUNICATION APPLIANCE DEVELOPER

A specialist who develops specialized communication devices, equipped with powerful lasers that will transmit huge amounts of data over long distances (in the long term, for the space Internet).

CROSS-PROFESSIONAL SKILLS

SPACE LAWYER

A specialist who regulates the relations of representatives of various countries in outer space and develops legislation related to the space exploration, space mining, etc.

CROSS-PROFESSIONAL SKILLS

SPACE POWER ENGINEER

A specialist developing and installing space energy sources devices, stations, satellites, etc., primarily solar panels (due to being more efficient in an environment with no atmosphere) and compact energy sources.

CROSS-PROFESSIONAL SKILLS

SPACE SMART CONTROL ARCHITECT

A professional who develops drone software transport and traffic management systems and controls intelligent control systems.

CROSS-PROFESSIONAL SKILLS

OPERATOR PROCESSING EARTH IMAGES FROM SPACE

A specialist who provides the work of the station receiving images from space. The receiving station is located in the radio-visibility zone of the space satellite/ship. The operator is engaged in specialized image processing for their further use by scientists and verifies the quality of the resulting products.

CROSS-PROFESSIONAL SKILLS

SPACE PRODUCTION ENGINEER

A specialist who replaces complex and expensive earthly production in space where it improves efficiency and pays off.

CROSS-PROFESSIONAL SKILLS

NEURONET

The first thing Nika felt was the warm rays of the sun. The room where she found herself was like a relaxation room or a cozy terrace of a sanatorium. The place was decorated with wallpaper of warm and bright colors, thick carpet on the floor, books and puzzle toys on a large rack, and soft armchairs.

In one of the armchairs, in the center of the room, sat a man in a bathrobe and slippers. There was a hot coffee cup on the table nearby, but the man seemed to have completely forgotten about it.

He intently, even as if irritated, was beating the rhythm on the tablet: tum-tum, tum-tum, tum-tum.

"Uh … hello," Nika smiled at the stranger, but he didn't even raise his head.

Nika walked over, carefully looking over his shoulder. On the screen were couples of words lined up in two columns: Sword and Shield. Harbor and Fire. Winter and Closeness. It was like some kind of a strange word association game.

The door opened. Four people in white robes with the inscription, "BiTronics Lab," entered the room.

A stout man of about forty-five nodded to Nika. "Already here? Nice. Do you study cognitive rehabilitation?"

"Yes …" Nika said uncertainly.

"Well, just in time. I am Stanislav. Remember these guys. Lida, our creative trainer," a nod towards the red-haired girl. "Gleb, mind fitness trainer." A tall blond guy smiled broadly at Nika. "And finally Vanya, a pharmacologist. Have you remembered their names? Then, let's get started."

Stanislav pushed a vacant chair to the man's chair and sat opposite. Only then did Nika get surprised. The stranger did not seem to notice that a noisy crowd of specialists burst into the room.

"Hello, George," Stanislav said softly. "How are you feeling? I see there is an urge to work."

"And who is this person?" Nika asked Lida, the creative trainer.

"Stanislav? He's a neural rehabilitologist. He helps repair damaged mental functions."

"I mean this … patient." Nika was embarrassed.

"Don't you know?" Lida stared at her like she admitted that she had a third eye on her forehead.

"Uh … no."

"There are still normal people," Vanya grunted.

"This is George Martynov!" Lida exclaimed. "Heard of 'The Saga of Snow and Ash?'"

"No…"

"How could it be?! He has already written seven books."

"What happened to him?" Nika looked at the indifferent writer.

"He fell victim to his own productivity," Vanya answered with undisguised sarcasm. "He shouldn't have written so much."

"There are ten main characters, and they still need to be exposed," Lida was indignant in an undertone.

"At his place, the shelves collapsed, and the books—"

"Vanya," Stanislav called.

"… Fell on his head. His skull was almost broken."

"Ivan Igorevich!"

"Oh, what?"

"That's all with the questionnaire! Are you going to take tests?"

Embarrassed, Vanya opened a small case with medical devices and went to the prolific writer's chair.

"The worst thing," Lida whispered to Nika's ear, "is that Martynov's cyclus isn't finished." The coach glanced at Stanislav, who gradually filled the spreadsheet on the tablet.

"You mean, Saga?"

"Yeah. For five years, the eighth book has been in progress. It was supposed to be a grand finale, promised to be released this year."

"And now having a post-traumatic stupor, he cannot finish the eighth book, and a lot of people are left without the finale," glumly summed up Gleb, who until then was quiet and sat on the side and played with a rubber ball.

"Yeah," Lida nodded sadly. "If we fail here, the world will lose a great science fiction writer. And I won't know if Prince Fratreon sits on the Glass Throne."

"He may not sit on the throne," Gleb threw, tossing a ball in his palm. "I told you how everything would be."

"Oh god, don't start again."

"What? Fratreon is the son of the White Baron. He just does not know about it yet."

"Do you really think that Martynov will end up copying Star Wars?"

"Do you remember how the Baron could have killed him in the dungeon in the third part, but let him go? "Why?"

"The Baron is twenty years older than him!"

"Have you noticed how little we know about their mother's past?"

"THEIR mother?!"

"Lida! Gleb!" Stanislav called on them.

The specialists were so inflamed that they attracted Martynov's attention; he began to fidget nervously and did not allow Vanya to draw blood for analysis calmly.

Lida and Gleb became ashamedly silent.

"Again? Disputes about family ties?" Vanya asked, having finished with Martynov.

The writer leaned back in his chair and irritatedly rubbed the cotton wool attached to the cut in a vein.

"As usual," sighed Stanislav. "What about your nootropics? I'm writing it down."

"We need additional stimulation of serotonin and dopamine," Vanya reported.

Stanislav threw his recommendations into the tablet. "Talking of nootropics, I recommend an increase."

"Two doses per day?"

"For now, yes. The patient has a deep apathy. It seems to me that it's not a matter of cognitive functions but in an emotional background. His mood must be artificially raised."

"Hmmm … Transcranial stimulation?"

"Excuse me," Nika could not resist asking, "What is it?"

"What exactly?" asked Vanya.

"Transcranial … And nootropics, too."

"Nootropics are special drugs that allow you to regulate the brain's metabolism," Vanya explained. "And transcranial stimulation also affects the brain, only by electricity or magnetic field."

"Like lobotomy?" scared Nika asked. She remembered terrible stories about how unfortunate patients got their brains burned with electricity.

"Well, no … We have a very weak and selective discharge. It is like a light brain massage."

"But it may be too early to apply it now," Stanislav announced. "Let's wait with the conclusion until the end of the morning exercises. Gleb, bring it on."

Nika curiously watched the preparations of the mind fitness trainer. The specialist carefully put a thin plastic hoop on Martynov's head and fastened electrodes on the temples and the back of the head. Then, he snapped on a special remote control, and out of the wall, a flat-screen TV came out. The opaque matrix lighted up with white, and in the center of it, a snow-white window appeared with a small black sphere.

"Okay, George," said Gleb. "Today, we train your concentration. Electrical signals from your brain will keep the ball in the air. You have to concentrate on preventing the ball from falling. Do you understand?"

Martynov nodded.

Nika noticed that the writer's face became completely dull. *Of course,* the girl thought. *"It's hard when you are treated like a disabled person for weeks.*

"I am starting the exercise," Gleb warned and clicked the button on the remote control.

The ball on the screen immediately smacked down. Martynov frowned, narrowed his eyes, and the black sphere fluttered up and down on the screen, not falling, but not rising either.

"Vanya," Nika asked the pharmacologist in a whisper, "but you really know how to control the brain? Well, through chemistry."

"It's impossible to control the brain," he snorted. "It's like a little universe. Drugs and electrical stimulation can only push the brain in some direction. Enhance your mood; improve your memory, that's all. Although, you know," Vanya added maliciously, sliding into a very quiet whisper, "it's easier with Martynov."

"Why?" asked Nika.

Meanwhile, following Gleb's instructions, Martynov used thought efforts to move the black ball from one corner of the screen to another.

"He has all the synapses for two things: how to link more characters in pairs and how to kill them later."

"A stupid stereotype," Lida muttered. "You do not like the Saga only because you can't follow the storyline!"

"Nothing of the kind," Vanya grinned. "I just prefer stories, where a schoolgirl with a crossbow can defeat a bloody dictator with an army of machine gunners and fighters."

It was impossible to understand from Vanya's face whether he was speaking seriously or mocking them.

The ball on the screen once again lost its course, went with uneven zigzags. Martynov gritted his teeth and the armrests of the chair, but he clearly could not concentrate. Nika almost felt the despair that the writer felt from his own weakness.

"Okay, enough for today," Gleb said quickly, also feeling the situation's awkwardness. With one click of the remote, he turned off the screen.

"Lida," Martynov suddenly said. Nika flinched when she first heard his voice, quiet but pleasant. "Could you pass that vocabulary test again? I consider it very useful to … get back to work."

The way he hesitated, talking about work aroused a thought in Nika's head. But thoughts like this one were still somewhat fuzzy, unclear, and did not want to take shape.

"Of course." Lida sat down in a chair opposite the writer and turned on the tablet. "Have you practiced with synonyms as I requested?"

Martynov nodded.

"Then, let's try. As usual, thirty words; choose a pair for each. The less standard associations are better." Lida's voice became soft, almost reverent. She clearly prayed for the progress of her literary idol.

"It is interesting," remarked Stanislav to Nika, continuing to write something down, "that usually drawings are used in the test."

"But Martynov is a writer. He works with words."

"Exactly," the neural rehabilitologist smiled. "That's why we adjusted the test."

The pairs of words that Martynov composed were displayed on a flat television screen. The writer picked up words slowly, uncertainly. And although it was clear that Lida was trying to come up with words around topics interesting to the writer, all synonyms of Martynov revolved around the same thing — an injury, an accident. Sword and Wound. Ship and Crash. Mountain and Fall.

And then, the thought that had been spinning the last couple of minutes in Nika's head finally flashed and poured into a clear form.

"Stanislav," Nika asked carefully, "can I throw George one association?"

The neural rehabilitologist was so surprised that he even stopped writing.

"Well, let's say, the test has a well-thought-out structure. If we break it, we can bring down the patient from the right course … You see, it's hard for him."

"Please. Just one word."

Stanislav looked doubtfully at Nika, then at Martynov, who had just faltered at the next word, and bowed his head, painfully fighting with his own ailment.

"Good. One word."

"George, I'm sorry," Nika addressed the writer. He raised his head, and the girl saw that he was about to cry from impotence.

"White," Nika said in one breath.

There was a pause, which seemed too terrifyingly long to Nika.

"Enemy," declared Martynov.

"Glass!" Nika blurted out.

"We agreed on one word …" Stanislav panted irritably.

"The chosen one!" Martynov even snapped his fingers, as if he remembered something very witty.

"Mother."

"Alive!"

"Baron?"

"Fight! Betrayal! Plan!"

The eyes of the writer burned.

"What did I miss?" Lida asked Nika twenty minutes later when they released noticeably perked up and energetic Martynov to rest. "How did you find the right words?"

"Well … to be honest, thanks to Gleb's theories." Nika smiled shyly. "I thought, since Martynov wants to get back to work sooner, then it will be easier for him to think about the stories, rather than about something …"

"Abstract?" pointed Stanislav.

"Yes."

"We missed," the neural rehabilitologist admitted. However, his face was pleased. "Restoring a creative personality requires personalization."

"So, we need to fine-tune the tests for the theme of the 'Saga?'" Lida blurred in a happy smile. "Oh, we can do it!"

"By the way," said Gleb, "maybe if we heat up George's creative fire, he will give us the first spoilers for the eighth book. What do you think? And then imagine, we are the first of all fans to know that Fratreon is a son of White Baron and…"

"Gleb!" Stanislav tapped his finger on the table, like an angry teacher.

"Sorry, got carried away."

"Don't talk nonsense," Stanislav continued angrily. "Fratreon cannot be a son of White Baron. He was recognized in the fifth book as the kindred blood by the chieftain of Merikians. This means that Fratreon is the Lost Leader. One who will unite the northern tribes and southern kingdoms."

Lida and Gleb stared at the mentor.

"Read carefully. And stop talking nonsense," Stanislav finished.

Nika could not stand it any longer and laughed. She couldn't stop even when the robotic rabbit's ears laid in her palms and carried her somewhere forward into the distance.

TASK

Come up with similar stories based on the following case, a vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the room where the characters work be like?

- What conflicts and surprises may arise during work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. You need to create a neural interface that allows paralyzed people to type texts with the power of thought. And in addition to it, software that would help them post on social networks. Also, you need to teach people to use the device.

Hint: specialists from the IT sector can be useful.

VISION OF THE FUTURE

Achievements of neuroscience have become the impetus for the development of many technologies, from "Telepathic" control of cyber prostheses and rehabilitation of people who survived a stroke to improvements of artificial intelligence. Neuronet has become one of the markets of the Russian National Technological Initiative state program for the development of promising areas of the economy. Much attention is also given to neuroscience in the world: Europe is developing the Human Brain Project, and the USA, during Obama's presidency, launched the BRAIN Initiative project. After all, the brain is the most important tool used by people, and the better we understand how it works, the more efficiently we will use it. In the future, it will be easier to monitor various conditions associated with brain activity, thanks to new, more accurate neuroimaging technologies (first of all, fNIRS* and PET**). Equipment will become cheaper, the resolution will be higher, as data analysis methods are being improved. All this means that we can more accurately understand where the activity of neurons occurs and what consequences have different changes in this activity.

Neuroimaging and mapping systems*** are actively being developed to help better diagnose neurological and mental disorders, as well as for understanding how our thoughts, emotions, memories, and other processes in the brain are arranged. The accuracy of mapping influences the development of many other technologies, from editing memories and neural interfaces allowing to control robots, up to treating dementia and the effects of a stroke. The problem is that our skull bones are very thick, and they absorb brain signals. This obstacle can be circumvented by using more perfect technologies of tomography, implantable microarrays,

and neural dust. Developed by researchers at the University of California, Berkeley, the neural dust is nanosensors capable of sensing the electrical activity of neurons and broadcast it to external devices. In addition, machine learning technologies help to better analyze the data and find important patterns.

Improvement of cognitive function and even treatment of neurological and mental diseases can be achieved without surgery, using transcranial magnetic stimulation (TMS) or transcranial electrical stimulation (TES), as well as stimulation of the brain activity using ultrasound and light. Transcranial stimulation is already well studied and has good effects in the short term (scientists from several universities, including Harvard and Oxford, after conducting their own research, found that electrical stimulation of approximately 20% speeds up learning and improves verbal memory). Brainstorm neurostimulator already sold in Russia for private use, promises to improve concentration and increase creativity, and vitalize.

Using technologies, we understand better how the human brain and psyche work, how our language works, and it helps to create more and more perfect artificial intelligence.

The market for virtual assistants is growing and more accurately understands our desires. For example, Amazon is already training its voice assistant, Alexa, to recognize emotions.

Neural interfaces also come to education. There are already university programs on the use of neurotechnologies in education. For example, at the University of London, the University of Bristol, and Vanderbilt University. And EMOTIV, in the fall of the year 2019, launched the interdisciplinary program Neurotech-Ed for children aged 10–18years old. Students will be able to create applications for biofeedback

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*   Functional near-infrared spectroscopy.

**   Positron emission tomography.

***   Creation of a detailed map describing the structure and functions of various parts of the brain, based on information collected by scanning and electroencephalography. All this is necessary in order to better understand how the brain works.

interfaces[*], and music and art with their help. In Russia, exists a study kit for fundamentals of neurotechnology, robotics, and human physiology, called "Young Neuromodelist."

US Defense Agency, DARPA, develops Target Neuroplasticity Training (TNT), which aims to develop safe, non-invasive neurostimulation methods to activate synaptic plasticity (i.e., the emergence of a greater number of connections between neurons). It is a synaptic elasticity that promotes accelerated learning. The program will combine neurostimulation technologies and conventional training for concentration, relaxation, generating ideas, etc.

Cognitive simulators are also being developed in Russia. For example, professor Alexander Kaplan at the faculty of biology, at Moscow State University, together with his graduate students, created the simulator E-Boi for e-sportsmen. It works on the basis of an electroencephalograph and improves communication between cortical neurons and motor neurons. One of the most promising technologies is brain-machine interfaces, which will allow the power of thought to control computers, robots, and cyber prostheses. This is not an easy task, because until the brain mapping has reached high accuracy, computers can only recognize a minimal set of brain signals. But in the future, the range of use will become wider. In the summer of 2019, Elon Musk introduced his Neuralink neuro interface: flexible polymer threads with electrodes are implanted into the brain, reading brain signals. The implant will connect wirelessly to an external device attached behind the user's ear and controlled through application for iPhone. In the future, the operation will be carried out by a robot neurosurgeon using a laser.

The development of neuroeconomics (the science of how the structure of our brain affects decision making) led to the emergence of new technologies in marketing and communications. On the one hand, these are all kinds of marketing and campaigning tricks, helping to influence people's behavior (fortunately, now, most of these researches are conducted on small groups of people, which reduces their representativeness), but on the other hand, support systems of rational decisions and emotional self-regulation. Knowing how our psyche works, we can optimize our activities and come to resourceful states faster.

Discoveries occur in the field of neuropharmacology. New ways appear for the treatment and correction of mental and neurological diseases, and as a bonus, scientists come up with how to enhance the cognitive abilities of healthy people. For this, new pharmaceuticals, electronic implants, and even activation of specific neurons using light (optogenetics), ultrasound (sonogenetics), and magnetic fields (Magneto technology) are used.

For neurons to become sensitive to a certain effect, they are changed with the help of gene engineering (currently there are two main options — either to breed genetically modified animals with such neurons or deliver the edited gene to a neuron using a controlled virus that is harmless to the body).

Now, it's very difficult to transplant donor brain tissue. Nerve cells greatly vary in function, and the patient's immune system often rejects foreign cells. But in the future, donor brain tissue can be grown from the patient's own stem cells. This will help treat injuries and neurodegenerative diseases[**].

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[*]   Biofeedback is the measurement of various physiological parameters of the user and showing him the results. For example, through the application for a fitness bracelet.

[**]   Diseases that result in progressive degeneration and/or death of nerve cells.

CROSS-PROFESSIONAL SKILLS

1. Systems thinking

2. Cross-industry communication skills

3. Project management

4. Lean production

5. IT

6. Customer focus

7. Multilingualism/ Multiculturalism

8. Social skills

9. Working in uncertainty

10. Art and Creativity

11. Ecological thinking
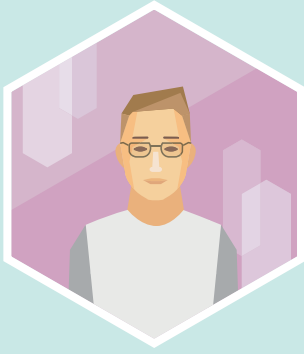
MIND FITNESS TRAINER

A specialist who develops programs for the development of individual cognitive skills (e.g., memory, concentration, reading speed, verbal counting, etc.) using special programs and devices. At the same time, he or she takes into account the psychological features and tasks of the user. Such programs exist now, in Russia, and there is even the Mind Fitness Education Association.

CROSS-PROFESSIONAL SKILLS
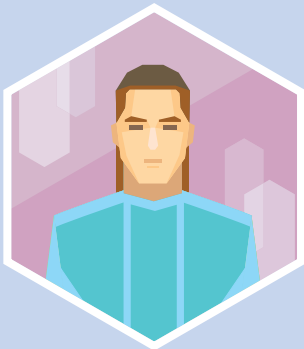
NEURAL REHABILITOLOGIST

A specialist who is involved in the rehabilitation of people with mental disorders and traumatic brain injuries using psychopharmacology, TNS, neural and biofeedback devices, etc.

CROSS-PROFESSIONAL SKILLS

NEUROPHARMACOLOGIST

A specialist who develops drugs that affect brain neurochemistry and increases productivity in healthy people.

CROSS-PROFESSIONAL SKILLS

NEUROMARKETOLOGIST

A marketing specialist using knowledge from areas of behavioral economics and cognitive sciences.

CROSS-PROFESSIONAL SKILLS

NEURAL INTERFACE DESIGNER

A specialist who develops interfaces compatible with the human nervous system for controlling computers, home appliances, and industrial robots. Today, neural interfaces are used mainly for entertainment: for example, the Australian Emotiv Epoc sells neural helmets to control characters in online games. But in the future, with their help, it will be possible to manage complex devices or even communicate without words with other people (as in the DARPA Silent Talk system currently under development).

CROSS-PROFESSIONAL SKILLS
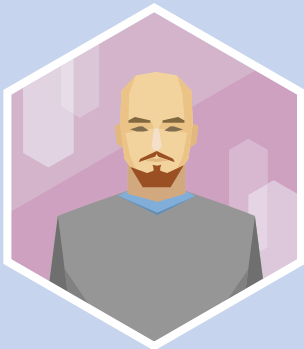
CONSCIOUSNESS TOOLS DEVELOPER

A professional who creates programs and equipment (e.g., biofeedback devices) to educate users on productive states of consciousness (high concentration, relaxation, increased creativity, and others). For example, Wild Divine sells devices and programs to users for training concentration, relaxation, and awareness. There are also biofeedback devices explicitly designed for lucid dreaming.

CROSS-PROFESSIONAL SKILLS

MANAGEMENT

The robotic rabbit began to descend in a U-shaped house with a yard and a sports ground. A small group in the yard flung their hands rhythmically. They moved uncertainly and slowly, stumbling now and then. The rabbit went down, and Nika understood why: the youngest in appearance was much over seventy.

"Don't land on these old people!" begged Nika. "Somebody will get a heart attack."

The roborabbit snorted in displeasure, abruptly changing course, and dived down.

"A pond!" shouted Nika. She inhaled a little more air, preparing to dive, but the rabbit at the last moment lowered her to the shore.

"You can when you want," grumbled Nika, brushing herself off the specks.

There was no one at the pond, and the girl wandered to the platform. Older women and men now squatted to an energetic count of their coach.

"One-two, three-four, we go down on the exhale, we go up on the inhale. One-two …"

"Disgusting," exclaimed a tired male voice behind Nika.

She looked in bewilderment at the one who appeared behind her. He was a forty years old man putting on a formal suit with sharp features, and narrow AR-glasses on the nose.

"I think it's great." Nika liked the older people working out. "Look at them, puffing and training."

"What's good here?" He dismissed her. "The group is designed for fifteen people. How many people are training? Four! No need to hang around here, let's go."

Without waiting for the girl's response, the man headed to the building, and Nika had to catch up.

A brilliant, albeit slightly worn inscription above the entrance, read: "The active longevity center Oldschool."

When they appeared, a pretty girl at the reception looked up with hope and sighed. The man in suit nodded to her and showed Nika the way.

They walked past the digital timetable: Nordic walking, coding, qigong, drawing, Chinese, modeling. Compared to visitors to the center, Nika seemed terribly lazy.

There was a gym on the right hand, and a digital voice encouraged a long and gray-haired man with dumbbells.

"Oh, and is it not dangerous for him to train alone?" Nika was worried.

"All parameters are monitored in real-time; a fitness bracelet controls correct execution. And if something goes wrong, a dispatcher will immediately receive a signal."

"Then why are those on the street training with a real coach?"

"For some, a personal approach is important," the suited man shrugged and pushed the door into a small bright workshop. On a wide table in the center, blocks of clay piled up, and elderly students worked around. The master woman ran from one to another, prompting and correcting.

"Five," said the man gloomily. This time, Nika immediately realized that he was talking about the number of clients.

"Already more than at the training," the girl tried to console him. The man looked at her almost with disgust.

Unlike him, the craftswoman was terribly happy about the appearance of Nika. As soon as Nika approached the table, she was given the work. The next half hour, Nika was busy bringing new pieces of clay and water for wetting and softening old ones. It was already difficult for older people to do this.

"Wow, well done," the chubby old woman with frisette hair rejoiced at her. She was the most talkative of all participants. "Are you first-timer? I have not seen you before. And do you like the job? Not too boring to deal with us old people?"

"Oh, why are you mocking her, Marya Alexandrovna," craftswoman jokingly chided her. "Working with you is a pleasure. Look, what a hippo you made!"

"You are just trying to console me," the old woman shook her head, pulled out a tablet, and pounded it with her index finger.

"Such an assiduous student," the craftswoman praised her. She records everything!"

"I'll go … I'll powder my nose, but I'll be back soon." Marya Alexandrovna stood up and smiled coquettishly at two older men on the opposite side of the table, grabbed the tablet, and headed to the exit.

"Nika, can I have a word with you?" The man in a suit appeared again at the girl's back. Yet so unexpectedly, that Nika flinched.

"I thought you were long gone. Has something happened?"

The man silently pushed her to the exit, but, as soon as they were in the corridor, looked around and spoke quickly: "Hurry, follow her!"

"Who?" the girl was confused.

"Behind the one with curls." The man carried Nika along with him. "This is not the first time she comes and records everything… Do you think it's just that? No way! Certainly. "New start" sent her."

"New … who?" Nika barely kept up with the man.

"Our competitors. We have been building a company for fifteen years to get to the top. And they are only three years in the market and have huge success. As sure as eggs is eggs, they steal all ideas. So, she's got to us now."

"She doesn't really look like a spy," Nika said with a smile. "Dear old woman asked how I like my work—"

"That's it! Why would she do that? She wants to lure you! We already know how many people left: both customers and staff. And all in recent years."

They stopped in front of the door with a graphic image of a woman.

"You have to steal her tablet. Let's see what she has on her lesson notes."

"Ha! Steal?" Nika was taken aback. "I cannot … If you wish so, go yourself."

"To the women's toilet?" the man snorted. "Too suspicious." And, without listening to more objections, he opened the door to Nika. "Hurry up!"

Nika felt disgusted. She did not want to steal at all, especially from such a cute old lady. She looked around, hoping that she had already left or brought along the tablet, but no, it laid peacefully on the sink's edge. "I don't want to take it."

Nika carefully touched the edge, nothing. The older woman did not jump out screaming, and an alarm didn't switch on. Then, Nika carefully picked it up and took a step from the toilet, but

indignantly put the tablet back in place. *The man in the suit wants to steal? Let him deal with this!* And it's time for her to get out.

Suddenly, the screen flashed, and Nika froze in place. The man was right; these were not lesson notes. The file that opened to her was a table in which the older woman methodically filled every cell. There were the needs of older people from the center, what they liked, what they disliked, their ideas on what could be added, and what could be removed. The curious woman even found out what products and gadgets her classmates use and which series they prefer.

The door creaked; Nika recovered herself and rushed away. The man understood everything from her one look.

"Good afternoon, Marya Alexandrovna," he caught the old woman as soon as she got out. "My name is Nathan. I am the head of the Oldschool Chain of active longevity centers. Could we talk in my office?"

"With pleasure, young man," smiled Marya Alexandrovna, not at all embarrassed. "But what is it about?"

"Feedback from customers is important to us, and you, as I have noticed, are actively visiting our courses …"

Nika thought that the older woman would be nervous or even trying to escape, but she was only smiling wider and took Nathan by the arm. "Lead your way, young man."

"Let's start with the basic question," Nathan said when they settled down in his office.

Nathan sat at the massive oak table, the old woman opposite, in the visitor's chair, and Nika aside, by the window.

"Are you working, Marya Alexandrovna?"

"Yes," the old woman answered eagerly. Of the three of them, she looked the calmest. "I am an anthropologist teaching at the university."

"What are you doing here?" Nathan feigned surprise.

"I like your center. I've been watching it for a long time. If I am not mistaken, this is the first private center for the elderly that has reached such a scale. A rich story, interesting development…"

"And so, you decided to steal ideas from us?" Nathan suddenly went berserk.

Nika started, and the old woman didn't bat an eye.

"I'm not stealing anything from you, young man. Why are you so nervous?"

"Then how do you explain your actions? You come here, ask questions, and write everything down."

"I told you so. I am a corporate anthropologist. And you don't need to worry like that," she added, seeing that Nathan was ready to jump in with his 'aha!' "I wasn't hired by your competitors, but by a shop for the elderly. I do field research for the target audience and identify future customers' interests and needs, tastes, and preferences. Don't you believe me? Call the manager."

Nathan did not give up. The old woman dictated the manager's data to him, and the man displayed a messenger on the screen behind him.

"Good afternoon," he said, as soon as a woman's round face appeared on the screen with a black square. "Do you know this lady?" He pointed to the old woman. She waved right there to the woman.

"Of course," the manager answered warily. "Marya Alexandrovna, we hired her as an anthropologist. What's the problem?"

"What is the problem?" Nathan went ballistic. "The fact that your anthropologist is climbing into the work center and spies for you!"

"I would not call it a spy. We do not do services, and we use your center exclusively for research purposes. We opened a shop for the elderly and wanted to …"

"You don't trifle with me! For fifteen years, everything was fine, but you came, and off we go."

"Do you think the issue is in some kind of competitor?" the woman snorted on the screen. "To you, nobody said that building an empire is not enough?"

You constantly need to upgrade." She leaned back in her chair. "Does your social media marketing work?"

"It works great," the manager folded his arms over his chest. "Good girl, already five years with us."

"Do you use deep machine learning algorithms?"

"What?" Let slip Nathan, but he immediately recovered. "What algorithms?"

"Well, for example, do you use neural networks to segment your audience?"

"Why use them? Katya herself can."

"Not at such a deep level," the woman shook her head. "Your Katya cannot explore several thousand profiles in two hours. I am not just a manager, but a manager of human-machine teams and I distribute tasks depending on who is better at coping — a person, a machine, or both together." She grinned, looking at how stretched Nathan's face was.

He wanted to object, but the woman raised her hand. "Your problem is not that you are not using machines. You have a common organization process that is hopelessly outdated. Do you think customers are leaving because of competitors? And did you know that the physical therapy group is unhappy with the load? It is too hard for them, and I am ashamed to complain. So, they run to other centers. And the coaches … It's not the 'New Start' that lures them, but an unhealthy atmosphere scares them. They constantly swear! What, didn't you know?"

"No." Nathan adjusted his glasses. "They didn't report to me."

"Yes, they are afraid to report! You say: 'No one is holding you here!'" Seeing the hunched figure of the suited manager, she softened. "Please, do not think that I am so smart. We have a whole team on the project. What I told you is part of our analysis.

"Resilient development consultant, Timur Islyaev. He helps to build right away stable and, at the same time, flexible systems. Timur, can you say a few words about Oldschool?"

She moved, and a smiling man with a red beard appeared on the screen.

"Hello!" he scratched his head and spoke briskly: "We didn't have tasks to analyze your center, but by what Marya Alexandrovna had already sent, there are several system errors." He began to bend his fingers. "First, tight centralization. You do not allow employees to take their initiatives and react to all their proposals as to a violation of subordination. Give them at least a little freedom, and see how many will come up with cool solutions!

"Second," he bent his finger, "Complex bureaucratic chain. You spend a lot of time on correspondence. You need to speed up communication between departments." He rubbed his forehead and smiled. "Well, that's all I can say right away. Better hire a consultant and let him take a good look." He thought for a moment. "I'm more on products, but there is a cool girl. She had a similar case in the Netherlands."

"It would be great!" Nathan threw his head up but then frowned. "Only … How much will it cost? Also, to bring her from Holland…"

"Take her on a couple of consultations and changes, and you will notice the benefits. I know a time broker who works with her, who…"

Nika reacted to an unusual word, "A time broker?"

The consultant explained, "These are people who sell time, freelancers — something like an agent who monitors job offers and gives its customers specific tasks."

"So, you can hire a tutor, only to prepare for a test?" Nika admired. "Cool!"

For some reason, Nathan did not share her enthusiasm. The friendlier they behaved, the darker he became. "Why are you helping me?" He finally asked.

"Why not?" the manager shrugged. "We are not direct competitors. Yes, and it is less profitable to compete. It is more beneficial to cooperate. We have a common audience, and we could research the market together and share experiences. If you want, I can connect you with our ecosystem architect. He is responsible for the interaction between different market participants."

"So, just cooperation? Do you need anything else?"

"We will help you, and you will help us," the girl smiled. "Well, let's discuss the details."

"Ahem," the old woman coughed from her chair. "My friends, am I free?"

Nathan and the manager stared at her in surprise. Even Nika managed to forget about her presence.

"Yes, of course." The manager pointed to Nika, "She will show you the way!" and right away turned to the screen. "So, what did you say?"

The anthropologist cheerfully jumped out of the chair and rushed along the corridor so swiftly that Nika barely kept up. The old lady clearly did not need to be escorted.

"I'm so sorry we suspected you," Nika said guiltily.

"Well, dear," the old woman smiled, "it was so exciting!" Instead of heading for the exit, the anthropologist turned to the workshop. "And now, with your leave, I'll finish making the hippo."

TASK

Come up with similar stories based on the following case, a vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might the room where the characters work be like?

- What conflicts and surprises may arise during work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. The company has opened a division that is working on a new ambitious project, a flying taxi. The task is to organize the collective work of new employees so that they propose brilliant inventions. Employees at the same time must work together with neural networks.

VISION OF THE FUTURE

Management is not a separate industry, and management specialists are present in all areas of the economy. Many of the management professions are suprasectoral, i.e., such specialists can easily move from one sector to another. In the future, production processes will become even more complicated, and the need for people with good organizational abilities will grow. Automation of solutions, which was discussed much earlier, will revolutionize management.

Its main task will be to search for distributed solutions, that is, the ability to form and coordinate distributed mobile teams of specialists for specific projects. More professionals will work remotely and part-time, investing their time and forces in several parallel projects. In addition, changes in society and culture of consumption will happen so fast that company management will need constant analysis of new trends.

Earlier, a typical control system looked like a pyramid with many levels of middle management, now the relations between employees are becoming more horizontal, workers have more freedom in making decisions, and some firms generally experiment with work without bosses. For example, in Valve, a game developer, which released the popular computer games Portal, Half-Life, Counter-Strike, and Team Fortress, all 400 employees have equal rights. And working on projects, they are united in teams at their discretion — without centralized leadership.

In the 2030s, more non-hierarchical organizations uniting companies with common interests will appear. They will be able to coordinate their activities so that every community member gets the most out of it. Inside companies, there will be a transition from rigid hierarchical structures to decentralization as well. In order for the company to be able to constantly adapt to market challenges, employee training should be integrated into the workflow and reconfigured to meet new challenges. Organizations create spaces for continuous employee development and support "internal entrepreneurship" — an independent search for solutions by employees in order to optimize the company.

Focus on company development shifts from profits to sustainability. Companies track their impact on the environment and social processes, take responsibility for this, and evaluate their decisions in terms of impact on nature and society as a whole. Businesses are increasingly combining in ecosystems, joining a wide range of players. Ecosystems gather information and opportunities, increasing the collective ability of participants to explore the market, adapt to it, and find new solutions. Nevertheless, harnessing this potential requires new management logic and the ability to collaborate. To achieve this, platforms are being developed that drive market stakeholders to act together. Philips, for example, organizes ecosystems in many areas of its business.

Such management requires more systematic and flexible thinking. According to the famous business consultant Ichak Adizes, something like organizational psychotherapy that corrects unhealthy biases in values and company strategies will emerge. The profession of a business consultant will undergo changes — from guidelines for mild mentorship, similar to psychotherapy when the client decides what to do, and the consultant only helps him evaluate all pros and cons.

Recent advances in deep learning transform HR[*] methods. Complex algorithms will allow identifying skills and capabilities that are not described in resumes (for example, analyzing data from social networks and professional trajectories of job seekers). One can also use contextual information about how other employees were successful in similar positions, as well as what background and experience helped them. There already exists software that helps HR managers make such decisions, for example, the Eightfold solutions.

In the 21st century, people are increasingly working together with algorithms and machines,

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[*]   Human resources is the department of the company that deals with finding, screening, recruiting, and training job applicants, as well as administering employee-benefit programs.

so one of the most important qualities of the manager becomes the ability to create mixed people-machine teams, train them, and manage them. A good manager must understand which tasks are best handled by the machine, and which tasks are more suitable for humans. Machines also become more autonomous — they use continuous feedback to learn and adapt. For example, Amazon pricing mechanisms are controlled by AI systems that learn and adapt as new information becomes available. The data they receive also affect other aspects of the business.

But AI capabilities are still limited. It can quickly analyze correlations in large data sets, but it is bad at creativity, the search of causation, or generalization of limited data. People will need to focus on what they do better, but companies will have to recognize that these high-level mental operations require more energy.

Therefore, the manager's task will include, on the one hand, stimulation of these high-level systems thinking, and on the other, planning periods of rest and reflection to avoid cognitive overload.

CROSS-PROFESSIONAL SKILLS

1 Systems thinking

2 Cross-industry communication skills

3 Project management

4 Lean production

5 IT

6 Customer focus

7 Multilingualism/ Multiculturalism

8 Social skills

9 Working in uncertainty

10 Art and Creativity

11 Ecological thinking

COORDINATOR OF COMMUNITY DEVELOPMENT PROGRAMS

A specialist who organizes and maintains a dialogue between independent manufacturers' teams, coordinating their long-term goals and a common vision of the future. He or she helps them determine the program of joint investments in production facilities and personnel. This is a new level of project management. In the future, managers will often have to coordinate the work of project teams whose members are in different countries.

CROSS-PROFESSIONAL SKILLS

COORDINATOR OF PRODUCTION IN DISTRIBUTED COMMUNITIES

More and more production facilities will be organized as a network of independent manufacturers which at various stages are involved in the production of the final product. In order to organize such processes, a kind of 'band-masters' are needed, that is, professionals who coordinate all aspects of order fulfillment and organize the work of independent teams working within the industry community for the development, production, and assembly of the product according to customer requirements.

CROSS-PROFESSIONAL SKILLS

ONLINE SALES MANAGER

A specialist who develops solutions for online promotion of offline companies' products. He or she organizes online marketing campaigns, accompanies the company's online stores, or works with partners on the improvement of customer service (e.g., delivery speed). This job already exists for some time now, but demand for such specialists will grow.

CROSS-PROFESSIONAL SKILLS

PERSONAL BRAND MANAGER

A specialist who helps clients create a personal brand. For this, she uses social networks and other offline and online resources. Creating personal branding is an important aspect of modern business coaching: image, exactly designed for the target audience, allows you to stand out among other specialists and become a public opinion leader in your niche. Therefore, the demand for this service is growing.

CROSS-PROFESSIONAL SKILLS
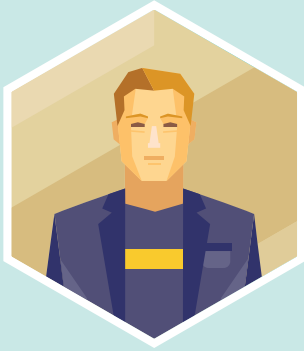
CORPORATE ANTHROPOLOGIST

This specialist explores new product markets relevant to the company using anthropological methods (e.g., participatory observation) and helps a company make contact with the target audience. In the West, work in the field of business has long been perceived as one of the logical career development options for an anthropologist, since the consumption of goods and services began to be studied not only from an economic but also from a sociocultural point of view. Professionals of this profile are hired by many IT companies, including Intel and Nokia.

CROSS-PROFESSIONAL SKILLS
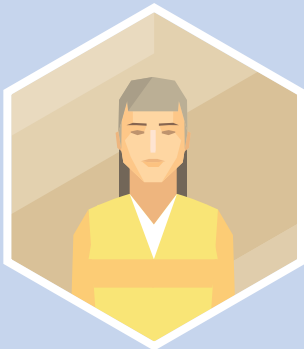
CROSS-CULTURAL COMMUNICATION MANAGER

A specialist who ensures the company's workflow in foreign languages and controls key meanings and values (for example, when choosing marketing slogans), teaches employees how to convey meanings in foreign languages, as well as features culture in negotiations with foreign partners. A cross-cultural communications manager advises company management on doing business in other countries. Lack of specialists able to deal with translation problems becomes the reason for not only unsuccessful deals but also failed advertising campaigns. For example, KFC's corporate tagline is "Finger-lickin' good" ("So delicious that you lick your fingers"), when translated into Chinese in the 1980s, sounded like, "We will bite your fingers," which did not contribute to the growth of popularity of American fast food among the local population.

CROSS-PROFESSIONAL SKILLS
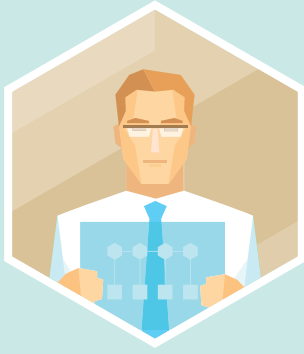
CORPORATE VENTURE FUND PORTFOLIO MANAGER

A specialist who manages the company's investments in startups created by its employees and focused on developing the company's product line. He or she accompanies the development of these startups from idea to production.

CROSS-PROFESSIONAL SKILLS
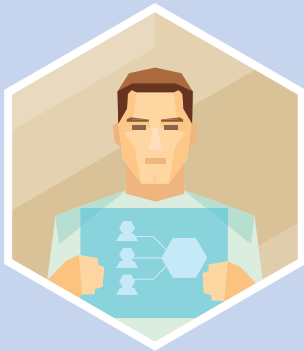
USER COMMUNITY MODERATOR

A specialist who organizes online and offline user communities, accompanies a dialogue with developers of company products, and supports their loyalty (for example, organizes contests and competitions).

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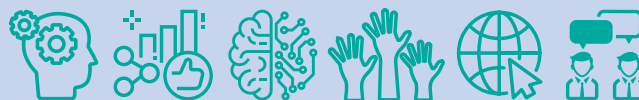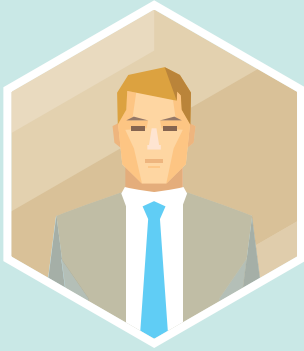
ONLINE LAWYER

A specialist in remote legal support through the internet, with respect to the laws of the country in which the case is to be conducted (regardless of the country in which the lawyer himself practices).

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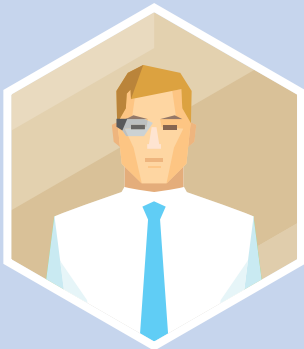
FORESIGHTER/TREND WATCHER

A specialist who tracks the emergence of new trends in various industries — economics, public life, politics and culture, and reports on the impact of the new trends on customer needs. In the future, the ability to work with visions of the future will be the universal skill of any manager.

CROSS-PROFESSIONAL SKILLS

TIME MANAGER

A specialist in the efficient use and distribution of personal time and time of teams. The main task is to optimize time distribution, taking into account new technological opportunities and personal or team needs.

CROSS-PROFESSIONAL SKILLS

TIME BROKER

A professional who sells working hours of freelancers, i.e., he manages someone else's employment in the open market. The development of technology reduces the need for a full-time presence in the office. Moreover, a professional who knows foreign languages can work for companies from other countries. At the same time, both freelancers and employers lack effective intermediaries, as recruitment agencies still mainly work with full-time positions, and sites for finding contractors (like Freelancer.com) are not convenient enough. So, the demand for time brokers will grow.

CROSS-PROFESSIONAL SKILLS

INVENTIVE PROBLEM-SOLVING CONSULTANT

A specialist who implements the tools of the theory of inventive problem solving (TIPS*) in companies developing innovative products. He trains staff to arrange brainstorming sessions that quickly lead to the creation of an original and useful solution.

CROSS-PROFESSIONAL SKILLS

* TIPS (or TRIZ) is a problem-solving, analysis and forecasting tool developed by the Soviet inventor and science-fiction author Genrich Altshuller. It is now used by numerous companies around the globe, including Samsung.
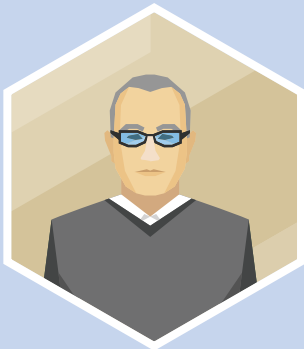
BUSINESS PROCESSES SCHEMATIZER

A specialist who creates various visuals of the processes existing in companies at different levels. The complexity and cohesiveness of business processes are growing both inside companies and in their interaction with external contractors (customers, partners, regulators, etc.) These visuals and schemes will allow better detecting of various bottlenecks in processes and optimize company processes.

CROSS-PROFESSIONAL SKILLS
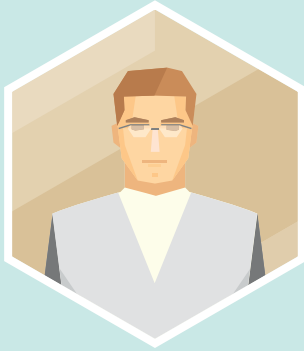
FACILITATOR

A specialist helping to organize successful group communication with a variety of discussion tools. This profession already exists but will become more in-demand as there are more and more cross-industry and cross-cultural teams, for whose members it is not easy to understand each other.

CROSS-PROFESSIONAL SKILLS
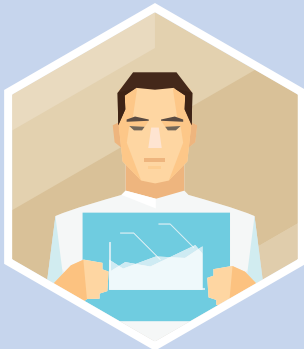
HUMAN-MACHINE TEAM MANAGER

A specialist who collects a team of people, programs, and robots for specific functionality, trains them to collaborate, distributes tasks, and monitors their process until task completion. Over time, any manager will have to master this skill, but for now, there will be few man-machine teams with specially trained managers.

CROSS-PROFESSIONAL SKILLS
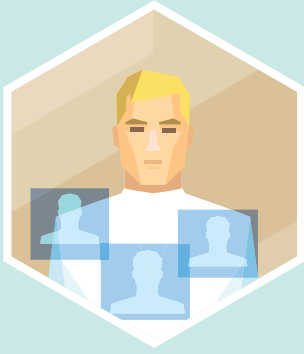
SUSTAINABILITY CONSULTANT

A specialist who helps companies reorient towards healthier values and priorities that contribute to the well-being of the environment and society (environmentally friendly production, more equitable social policies, etc.). In the future, he or she can transform into an ethical mentor who will help make decisions in controversial ethical situations.

CROSS-PROFESSIONAL SKILLS

STAFF COGNITIVE WORK OPTIMIZER

A manager who is responsible for balancing high-level intellectual workloads and periods of rest, meditation, or switching between tasks. All of this will allow maximizing the use of the mental abilities of employees.

CROSS-PROFESSIONAL SKILLS
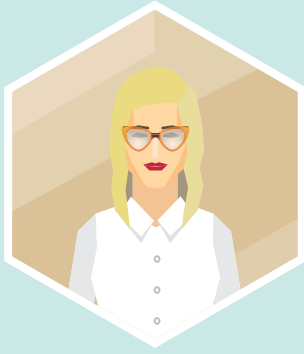
DESIGNER OF MARKETS/INDUSTRIES

A professional who designs new markets. He analyzes different audiences, their lifestyle, and preferences, and understands what new types of products and services could be useful to them. Then, he or she compiles directories with their lifestyles and designs markets for them, forming guides for suppliers of goods and services.

CROSS-PROFESSIONAL SKILLS

PRODUCER OF INDUSTRY-SPECIFIC COWORKING SPACE

A specialist who creates and guides industry-specific coworking space in accordance with the needs of the region. He or she analyzes region needs, creates a concept, selects equipment, invites residents, and a team for creating a coworking space (including architects, marketing specialists, operational specialists).

CROSS-PROFESSIONAL SKILLS

CHILDREN'S R&D MANAGER

A specialist who organizes the creative work of children in inventing new children's goods and adapts their ideas for production. Sometimes, children manage to come up with more interesting design ideas than teams of adult professionals. For example, the famous artist Damien Hirst admitted that creating new concepts, he uses ideas that came to him when he was a child. And in 2014, the twelve-year-old Shubham Banerji using the Lego kit made his own Braille printer which was ten times cheaper than existing options on the market.

CROSS-PROFESSIONAL SKILLS

EXPERIENCE MANAGER

A specialist who forms a positive attitude of the client to the company. His or her tasks include managing offline and online interaction experience, which increases the loyalty of the customers. With growing competition, managers will have to find marketing solutions that affect the entire gamut of customer feelings and respond on an intellectual and emotional level.

CROSS-PROFESSIONAL SKILLS
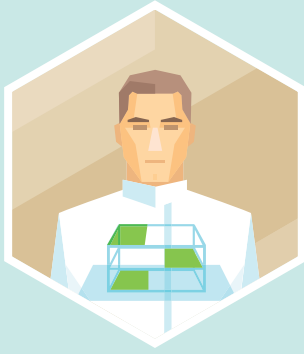
ECOAUDITOR

A specialist who audits industrial enterprises and makes recommendations on the reduction of environmental impact due to modernization of production, changes practices, and ways of working. This is an existing profession today. In Russia, it has existed since 1993. But as the environmental awareness of society increases, there will be a growing demand for it.

CROSS-PROFESSIONAL SKILLS

HR GAMIFIER

A specialist who develops an employee's management system, which will involve them as much as possible in activities that motivate them for the effective and balanced performance of their duties. Such a specialist is responsible for the development and implementation of performance-enhancing gaming practices in accordance with the functionality and character of an employee.

CROSS-PROFESSIONAL SKILLS

HR DEVELOPER

A specialist who creates complex algorithms for selecting candidates for vacancies. These algorithms must take into account all sorts of factors that can affect the effectiveness of the candidates in this place. It will require a combination of skills, including HR-competencies, programming, and deep machine learning.

CROSS-PROFESSIONAL SKILLS
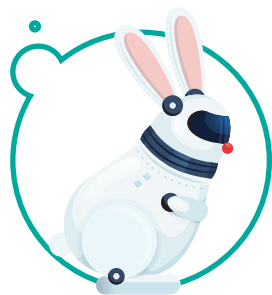
METALLURGY

As soon as Nika felt the hard floor under her feet, she immediately heard a modest rumbling coming from somewhere below. The girl opened her eyes and looked around. The transparent cabin where Nika found herself in was hanging over a spacious room filled with people and machines. The glass partially drowned out the noise, but the hiss of red-hot metal, the clang of mechanisms, and the knock of pistons still reached the cabin, merging into a rhythmic mechanical choir.

Was this a smelter? Was she back at the factory?

An elevator crawled from above. The doors opened, and five people entered the cabin: three men and two women.

"Already here?" said a tight man of about fifty, with a weighty ring on the wedding finger. Without waiting for an answer, he shook Nika's hand. The five sat down at an oval table made of transparent plastic so that everyone could both see the workshop below and look at the digital monitors mounted on the table.

"Well, Dmitry, what is the forecast?" Asked a blond guy of about thirty. On his badge, one could read "E. Borodule. Senior electronic waste recycler."

"The forecast, Eddie, is a complete disaster, proving my point," muttered Dmitry. "At the current rate of production, reserves in our mines will be over next year. If during this year we do not reformat the enterprise, it will simply be closed."

A wave of sounds ran across the table: a tragic whistle, a disgruntled murmur, and a drawn-out melancholic "Well …"

"In this regard, it will be necessary to lay off … one and a half thousand employees, tentatively," Dmitry continued. "The entire processing facility," he pointed down, "will be scuttled. There will be nothing to process."

"Is there any good news?" asked a pointed-nosed woman, on whose badge was written, "A. Karnaukhova. Advisor on new metals."

"Yes, Angela. Our management is desperate and ready to listen to you. So, let's discuss your plan."

"Okay," Eddie rubbed his neck. "Our first question is what materials to use. What to use as raw materials."

Dmitry nodded.

"So, our option is the processing of obsolete electronics. Now, any device becomes obsolete in a year and a half. Or, in two, at most. Outdated models can be processed into raw materials for the plant."

"Well …" Dmitry said mockingly. "Where will I find so many smartphones? Will I take the workers'?"

"Why?" shrugged Angela. "I can put a notice on four social networks and ten news resources right now."

"What notice?"

"That an enterprise needs used electronics. If your products are valued, people will respond."

"So, they will respond that they will give us their electric toys?"

"Do you know how many unused devices can be found on average in a family of three? Two to five. The old Walkman, which they forgot to sell or throw away. A broken phone that was never repaired. People buy new things, old things collect dust, and they simply forget about it. And so, people will have a reason to get rid of it. Plus, the psychological motivation that it's not just for some reason, but a good cause."

"Sorry," Nika said. "If I understand correctly, in factories like this, you need copper, cast iron, that's all."

"And precious metals," Dmitry put in.

"Well, yes. How can smartphones replace this?"

"Copper, silver, gold, and diamond dust are used in their production," answered a muscular man with the signature on the badge 'M. Sibekin, junior designer.'

"And if you collect a thousand, five thousand, ten thousand devices, all these grams together are already a resource. That's why we need Angela. She will push the idea so that we get as much as we need."

"Good," Dmitry sighed. "Do you have a list of devices that suit us?"

"I sent it to you," the muscular junior designer pressed the button on the smartphone. "A full list, given your current equipment."

"And yet, these are grains. I can convert … well, maybe fifteen percent of our capacity for smartphone recycling. This will be enough for the whole idea with devices recycling, even if they bring us a million gadgets. Instead of one and a half thousand employees, it will be necessary to dismiss one thousand two hundred."

A woman with large blue eyes coughed delicately from the edge of the table. "A. Zaushnikova, bio-metallurgist," read Nika on her badge.

"You see," the bio-metallurgist said quietly, "you still have low-grade ore." The woman nodded at the monitor mounted on the table. She turned on some video with a computer simulation. "As you see, it is also possible to flush out particles of the metal we need from them. For example, copper."

"Flush out? How?"

"I can put a special compound into the ore that chemically breaks down metal and slag. If there are many different metals in the impurity, I can choose the composition so that it washes out a particular metal. Or a few specific ones. This is a custom process."

Dmitry looked at the simulation, rubbing his chin thoughtfully. Nika tried to make out something on the screen, but the chemical formulas that accompanied the three-dimensional ore models were too complex and multi-stage.

"This is all good," Dmitry finally hummed. "But not enough. There will still be fewer raw materials than now, while there are still mines. Profits will be reduced, and there will be less money on maintenance and salaries. Perhaps, by your efforts, we will not lay off ninety percent of employees, only seventy. Maybe even sixty. All the same, a large part of the team will be fired. Is this problem solvable?"

There was a pause in the room.

"But profit, after all, depends not only on quantity …" Nika thought aloud. "Not only on how much is being sold … but also on what and to whom it is being sold."

"Fine, girl," smiled Angela. "In a nutshell, you said what we wrote down in two hundred. I sent you a file. It contains a phased plan for re-engineering the enterprise. Show it to your bosses."

"And what is the point?" Dmitry incredulously asked.

"The basic idea is very simple. From heavy industry, you need to reorient to robotics and health-care. Products for these industries require fewer raw materials. But this raw material is more difficult to manufacture."

"Therefore, it can be sold at a higher price," Eddie concluded.

"In addition, you will need more qualified personnel for such delicate work. Your employees will have a field for growth. But you will need to train them additionally. And yes, at the end of the document, I outlined a couple of dozen players with whom it makes sense to establish sales contacts."

"The process, of course, is not instant," Eddie added. "But you said that you have a year. If you start right now, then by the time the mines are depleted, you will already be working in a new format and will not go down the drain."

Dmitry scanned the documents on the tablet and rubbed his chin. "Is it possible to organize retraining courses for my people in the coming month?"

"I'll take care of it personally," Eddie promised.

"Welcome, then I'll show it upstairs. We will try to scatter all this for the coming year."

No one said anything out loud, but Nika felt as if the air in the cabin after Dmitry's words became less dead, the poses of the experts had become more relaxed, and even the noise below seemed now more melodic.

"I wanted to ask," Nika turned to Eddie later, when Dmitry went upstairs, and the specialists were waiting for the elevator to leave the cab. "How often does it happen in the future … well, that is, now that entire enterprises are dying out because there are no resources?"

"It happens," Eddie nodded. "But look, do you think that the time when coal and steam were replaced by electricity was about dying?"

"No, it's more about development and evolution."

"Well, what people take for dying is often just evolution. Science and industry cannot remain unchanged. Sometimes change is preceded by a crisis, such as the same lack of resources. This can be taken as an end — or an opportunity for an enterprise to adapt, gain new knowledge, and learn new skills."

Automatic elevator doors kicked in. The roborabbit was chafing on Nika's knee.

Eddie turned around. "Are you with us?"

Nika silently shook her head. How would she explain that she is in the future only on a sight-seeing tour?

TASK

Come up with similar stories based on the following case study, a vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might a room where heroes work be like?

- What conflicts and surprises may arise during work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case. You need to create a new alloy for biocompatible implants that replace bones. The material should be lightweight, safe, and porous so that bone tissue can be grown on it. Most likely, it will also require the participation of specialists from the "Medicine" chapter.

VISION OF THE FUTURE

Metallurgy is one of the economic sectors, where Russia has strong traditions and a good position in the world. But at the same time, we see a lack of flexibility in the sector, and due to increased global competition, significant changes are needed. Production will become greener, equipment will be upgraded, and technological processes will be improved. White metallurgy* will gradually become the industry norm, the principles of which are already being introduced today, for example, at the ChelPipe Group.

Methods of production of products that minimize environmental impact will become more widespread. Waste from metallurgical production will be used for the production of other substances (primarily acids, alkalis, sulfur). In addition, the scale of metallurgical production will change. Instead of giant plants, medium-sized enterprises will appear. They will be more flexible and able to perform operational quality control at all stages of production. There will appear mobile plants producing specialized metal. They can be launched in places of high demand for metal (for example, next to large construction sites).

Customer requests are changing. In particular, the need to reduce the weight of structures while maintaining their strength leads to a drop in demand for traditional products of the industry — black rolling, pipes, ingots, slabs: they are replaced by new materials (plastics and composite materials, including carbon fiber, metal composites, cermets, etc.).

At the same time, demand for new products such as metal powders and complex alloys will increase. Powder metallurgy technologies make it possible to create new composites through a combination of different powders (including those metals that cannot be fused with each other, for example, titanium and magnesium). In addition, they can use metallurgical waste, saving resources.

The production of precision alloys, i.e., metals with predetermined properties (elasticity, fusibility, conductivity, etc.), will expand.

The share of biometallurgy, a process in which metal is extracted from a low-grade ore using microorganisms, will increase. It allows you to significantly reduce the cost of production. Microorganisms can dissolve the metals themselves or the surrounding minerals for easier access.

Production will become more automated and robotic. The number of metallurgical professions (and there are now more than five hundred) will slowly begin to decline, transferring to the category of "retired professions," and more universal equipment operators will take their place. Workers will perform less physical operations and switch to remote control of technological processes, sometimes even without being present at the site.

Digital models of the production process make it possible to predict various manufacturing defects, significantly reducing costs. Usage of cyber-physical systems in production is growing, and this requires employees to have more knowledge of IT and, in particular, data analysis, the building of statistical models, and programming of automated systems.

Technologies are being developed that allow the development of deep-water deposits (the concentration of rare metals is very high in them), and plans are also being developed for the extraction of metals on asteroids (see more on this in the chapter "Space"). There are great prospects for the extraction of valuable metals from electronic waste (for example, the processing of 1 million cell phones allows you to get 16 tons of copper, 350 kg of silver, and 34 kg of gold).

The State Atomic Energy Corporation, Rosatom, is already building a line for processing electronic devices designed to process 5,000 tons of electronic waste per year.

In the future, metallurgical companies will offer package solutions to customers, ranging from the development of tailor-made "smart metal" to technical engineering solutions for the parts created from it, advice on the maintenance, and recycling of outdated products.

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*   White Metallurgy is a new standard in metallurgical production that emerged in Russia in 2010. Key idea of this approach is to create a sustainable metallurgy plants, which will allow employees to work in clothes of any color, including white.

CROSS-PROFESSIONAL SKILLS

1 Systems thinking

2 Cross-industry communication skills

3 Project management

4 Lean production

5 IT

6 Customer focus

7 Multilingualism/ Multiculturalism

8 Social skills

9 Working in uncertainty

10 Art and Creativity

11 Ecological thinking

NEW METALS DESIGNER

A specialist who develops alloys with predefined or changing properties due to operating conditions.

CROSS-PROFESSIONAL SKILLS

ECORECYCLER IN METALLURGY

A professional who develops recycling methods for metallurgical waste and helps restore the environment.
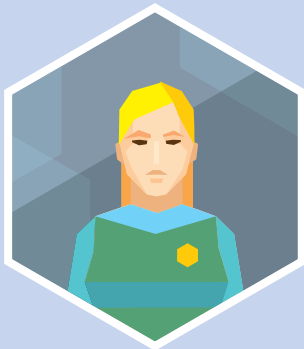
CROSS-PROFESSIONAL SKILLS

EQUIPMENT SUPERVISOR

A specialist with competencies in mechatronics and engineering, accompanying and servicing high-tech equipment throughout a life cycle.
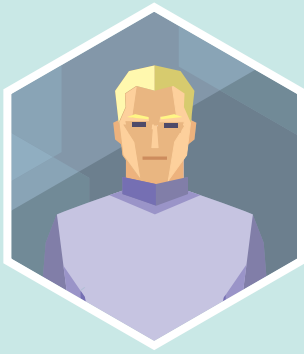
SYSTEM EQUIPMENT MODERNIZER

A specialist who evaluates the equipment of the plant, draws up a plan for the introduction of more modern equipment, and accompanies this process.

IT METALLURGIST

A specialist who, using high-tech equipment, builds digital models of processes taking place at a metallurgical plant and is looking for ways to optimize them.

CROSS-PROFESSIONAL SKILLS

BIOMETALLURGIST

A specialist who, with the help of microorganisms, extracts metals from low-grade ore. The processing of these ores by traditional methods is unprofitable, and the use of microorganisms can greatly reduce the cost of the obtained metal. And this process is less harmful to the environment and is easy to automate.
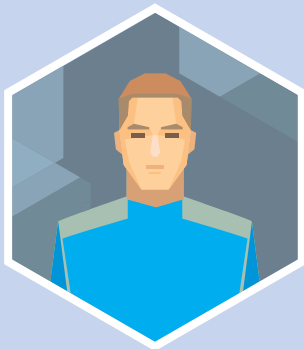
CROSS-PROFESSIONAL SKILLS

ELECTRONIC WASTE RECYCLER

A specialist who extracts valuable metals from electronic waste (old smartphones, computers, etc.).
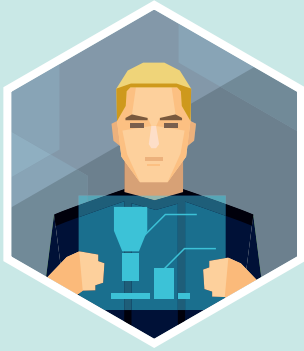
CROSS-PROFESSIONAL SKILLS

NEW METALS ADVISOR

A specialist who comes up with a package of engineering solutions for a client to use new metals in specific products.

CROSS-PROFESSIONAL SKILLS

POWDER METALLURGY DESIGNER

A design engineer of new equipment for producing metals of a high degree of readiness (metal powders, alloys).

CROSS-PROFESSIONAL SKILLS

CULTURE

Nika landed in the middle of a wooden platform and did not have time to come to her senses when men and women, dressed in black from head to toe, attacked her. They spun around Nika, narrowing and narrowing the circle.

"Aaaah!" squealed Nika and sat down, covering her head with her hands. Music rattled around, and inhuman screams tore through space; a light appeared and disappeared.

"Stop!" an imperious male voice was heard, and everything was quiet. The black people stepped back, and Nika peeped upon her hands, covering her head.

"Well, who is it?" Continued the voice in exasperation. "I told you, no strangers on stage!"

"It's me," Nika said uncertainly and felt very embarrassed. There was no attack. Either actors or dancers surrounded her, and in front of them was an almost empty stall. Only two places were occupied. On one sat a tall, calm woman, the other was occupied by a tall, curly-haired man who wrung his hands picturesquely.

"It's impossible! Just impossible," he wailed as he grabbed his chest and fell into a chair. "Nika, baby, I asked no one to be on the stage when we rehearse! Now, go and get me some water. Oh, I'm dying …"

Nika quickly got off the stage and rushed to the door. She didn't want the curly man to die because of her.

In the foyer of the theater, everything looked very old-fashioned — like in Nika's time. Only approaching the wall where the cooler was located, the girl noticed that the portraits' frames were actually digital and only imitated paintings and photographs.

Instead of plastic cups, bamboo ones hung next to the cooler in a stack, and the inscription under them reminded them to return the cups to a special disinfectant compartment.

When Nika returned, the choreographer (or whoever he was) was reclining in an armchair, and dancers were crowding anxiously around him. The man drank the water in one gulp, tapped a glass on the armrest, and groaned, addressing a calm woman on the right: "Taisia Pavlovna, forgive me, but I can't work like that. Movements are simply not born, and that's it!"

"And what do you see as the problem?"

"What do you see as the problem?!" the choreographer mocked her. "Can't you guess? You are the curator, Kotova. Of..of … collective creativity! You should feel it!"

"Feel what?" Taisia gave him a sympathetic smile.

"There is no soul in this music!" the choreographer tragically clasped his hands and shouted somewhere into space, "Come on, start!"

Music began to play from the speakers, and this time, Nika recognized it, despite the unusual beats and rhythms. "It's the Dying Swan!" the girl was delighted. "Only a bit strange one…"

"Not "Dying," but simply 'Swan,'" the choreographer corrected irritably. "Oh god, does anyone in this theater know the history of music? Only illiterate ignoramuses around me. But that it's strange, honey, for sure! What did you add to it?"

"Not us, but the neural network," said the curator. "Please state what exactly you do not like, and I will ask for it to be corrected. I will contact my curator of human-machine creativity …"

"Wait a minute," Nika felt bewildered. "So, did the neural network create the music? Or a man? This, curator … of machines?"

"The neural network composed the variation on the theme of the Swan," Taisia answered. "The curators are some kind of mediators. I help various team members work together, and the curator of human-machine creativity works for people and machines."

The woman pulled out a tablet and put it on the armrest between herself and the choreographer. The swarthy face of a young guy, almost a teenager, appeared on the screen.

"Hi, Amir," the curator smiled. "We have questions about the music for Swan."

"Yes, yes," the choreographer interrupted. "Look … Our Swan is dying due to an oil spill in the river … Dying, you know? Your beats have made the melody so merry as if we are glad that the bird dropped dead. The miniature is already written in a major key, so you added some fun to it." He sighed heavily. "I need pain, anguish! What reference did you use? Whatever you call them, Timberlake and the early Kanye?"

"The neural network analyzed the tonality of the melody," the curator of human-machine creativity shrugged. "It did not know that the Swan should die. Give me your references, and I'll fix it."

The choreographer thought for a second, tapping his fingers on the armrest. "So … We will begin, of course, with Oxxxymiron and also this … the glorious boy who fought with him … Like him…Dizaster! Here, they are well suited. And … let's get Calvin Harris."

"Yeah," the guy handed out and knocked on the keys. "So … Five minutes!"

"Why so fast?" Nika was surprised, recalling that it took several hours to create the text in the neural network's editorial office.

"There's little work here. Three minutes in total. Well, we have a fast machine."

A few minutes later, the curator of human-machine creativity turned on the music, but before they had time to listen properly, the choreographer waved his hands.

"No, no, no! I think … more of Calvin Harris, less Oxxxymiron."

After another five minutes, he asked for more speed, then to turn it down. Then, again, to add speed, but this time, only a little. Nika already ceased to understand what kind of tune they were listening to when suddenly the choreographer exclaimed: "Yes, this one is great!"

The discouraged dancers perked up.

"No, of course, not like a living composer," the choreographer added right away. "But it does it quickly and does not grumble," he looked around.

"Turn it on!" He shouted into space, and as soon as the music started sounding, he began to dance. He waved his hand, bent over, and spun around his axis. "Yeah. Yeah. That's it! Verochka!"

A thin girl in white fluttered out onto the stage, and the choreographer began to explain to the dancers exactly how they should surround her.

"Put on the underscore," he ordered a couple of minutes later and moved to the chair. The music sounded louder, more alarming. A white spot flashed behind the dancers, and the darkness at the edges stretched toward it.

The girl-swan trembled in the center of the stage, and black people, drops of oil, as Nika now understood, attacked, ready to devour, then rolled away, giving hope for salvation. But it was not there. A broken swan bowed its wings, darkness filled the entire screen, the cries of birds reached a peak, and at that moment, a new, even sharper cry came from behind the spectators.

Spellbound by the action, Nika flinched and turned around. Between the rows, a woman with multi-colored dreadlocks hurried to them, belligerently waving a bamboo glass.

"What are you … Yes, what were you thinking, Arngold?" — The choreographer attacked him. — You break into the middle of the creative process! I understand Nika, but you…

"Drops of oil are behaving wrong," Arngold stated.

"What?" the choreographer was taken aback.

"I sent you a macro shoot from the lab." They can't hang around here. And they spin in the wrong direction. Did you watch the shoot?"

"Yulia! This is not about the shoot!" the choreographer grabbed his head. "This is an art, not biology textbook! Movements convey a sense of growing danger, give hope, and then take away …"

"Physics," Arngold interrupted. The man hatched at her, and she specified. "A textbook. The movement of droplets is studied by physics, not biology." She nervously jerked the nearest dreadlock. "If we show an environmental catastrophe, we are inspired by real physical processes, and we need to show them true-to-fact. This is an important part of the work of a science-artist …"

"Whom?" Nika interrupted, interested, and the woman immediately turned her attention to her.

"Science-artists are inspired in their work by real natural processes, using science for self-expression. Any fool can come up with something."

"Have you called me a fool now?!" the choreographer broke out.

"Friends," the curator of collective creativity rose from her seat. "Let's calm down a bit. Nobody called anyone a fool and, I hope, will not. We specifically invited both of you to the project. Each of you has a unique vision, and from the mix, we'll get something incredible."

The science-artist smiled, and the choreographer pursed his lips.

"Let's do it. Our wonderful Arngold will show the dancers what the movement of oil droplets should be like, and the best of the best choreographers will figure out how to add aesthetics and emotions to them."

The science-artist nodded and went to the dancers, chose one of them, and explained something to him. The dancer nodded, spun, the woman straightened him, and swirled differently.

"Let's get together now!" said the science-artist, and the dancers spun, gradually approaching the swan girl. "Well, that's much better!"

"Awful," the choreographer folded his arms across his chest. "And how can I work with this sordidness? No, this is completely impossible!" He rushed to the dancers. "Keep your back like this. And do not throw your hands. You are hopeless; that's how it is! What about a swan? Oh, dear…" then he turned to the science-artist. "Show her how real swans wave their wings."

Taisia and Nika moved away so as not to interfere with the creative process. The girl only shook her head.

"So different! How don't they drive you crazy?"

"Oh," the curator laughed, "when there are only two, it's nothing." To make contact with thirty very different people is a problem.

"I would have put my foot down a long time ago and shown them myself how!"

"That won't work. I need them to work together, but on their own. Why recruit talented people and then crush them with your vision? Creators, after all, are not ordinary performers. The trick is not to limit, but to allow it to be fully revealed … And to prevent the murder in the process."

The doors suddenly swung open, and the "Flight of the Bumblebee" burst out. Under the dumbfounded glances, the robotic rabbit flew into the hall.

"Oh, dear," the choreographer exhaled sharply. "I'll take this robot!"

Nika broke out and rushed to the rabbit on the move showing it to go away.

"Sorry," Nika squeaked, blushing more and more, "this is my… mmm … uh … time to go!"

TASK

Come up with similar stories based on the following cases, a vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

- How many different specialists do you need to complete a task?

- What might a room where heroes work be like?

- What conflicts and surprises may arise during work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case 1. You need to evaluate the cost of street art destroyed by a vandal in order to get compensation from the violator.

Case 2. A famous physicist wants to learn how to draw; for this, he needs to study visual art and awaken creativity.

VISION OF THE FUTURE

Culture is one of the most ancient spheres of human activity, but gradually, it became the prerogative of a narrow circle of professionals. However, as routine functions in the work move to machines, more and more people will begin to engage in creative activities and become authors of artworks. This is facilitated by the availability of visual technologies (special photo filters for iPhone allow you to create artistic photos literally on the go, and the Garage Band app can replace recordings in a music studio) and the blurring of art criteria. The development of technology can bring humanity to a new level of perception of art and a new level of creativity: it will be possible to create more complex art objects using 3D printers, robots, and neural interfaces, and even learn how to better manage the creative state of mind.

We now see a transition from the classical ways of art communication with the audience which include interactive formats are increasingly being used. Interactive books for iPad are being created; an immersive theater is gaining popularity, where there is no division into spectators seating and a stage, and the audience is involved to the maximum in performance.

The interpenetration of art into other areas gives interesting combinations — for example, science art, a type of modern art where artists use the achievements of science and are often scientists themselves. So, the Australian artist, Guy Ben Ary, created a mini-orchestra out of his own cells, neural networks, and analog synthesizers.

Art will begin to play an important role in education. Art universities may appear where students will learn through various forms of creativity. The development of aesthetic flair and creative skills becomes important, not only for humanities but also for programmers and engineers, because, when developing high-tech products, you need to think creatively and be able to communicate with the consumer, understand his emotions and design impressions (with which art works). Therefore, the abbreviation STEM (S = science, T = technology, E = engineering, M = mathematics), which is considered as the cornerstone of modern engineering education, has turned into STEAM (+ A = art).

Art is becoming more collaborative. For collaboration, artists of different profiles come together, and scientists, programmers, and even artificial intelligence join them. Neural networks are already capable of creating pictures, videos, music, and even poetry (one of the most striking examples is the neural network Jukebox made by OpenAI employees that is capable of creating original music and even "rudimentary singing"). Accordingly, something similar to project management will also be needed in this area: someone should help creators to distribute efforts.

New technologies also help artists who create social works. Themes for inspiration are increasingly ecological and digitally cleaned. For example, the artist Daan Roosegaarde, on the 125th anniversary of the death of Van Gogh, painted a bike lane with fluorescent paint, turning it into a "starry path" based on the paintings of the great artist. During the day, the painting absorbs solar energy, and at night, it illuminates the lane, saving electrical energy.

CROSS-PROFESSIONAL SKILLS

Systems thinking

Cross-industry communication skills

Project management

Customer focus

Multilingualism/ Multiculturalism

Social skills

Lean production

Art and Creativity

Ecological thinking

Working in uncertainty

IT

ART APPRAISER

A specialist who is able to assess the artistic value and market value of new formats of works of art, which consist of heterogeneous elements that are complex and/or short-lived (for example, art, street art, or performance art).

CROSS-PROFESSIONAL SKILLS

SCIENCE ARTIST

A person who uses scientific data and knowledge in his work. Science art is actively practiced by individual artists and is even supported by reputable educational institutions. For example, at MIT, there is a center for science, art, and technology.

CROSS-PROFESSIONAL SKILLS

PERSONAL TUTOR ON AESTHETIC DEVELOPMENT

A specialist who is well versed in the cultural field and can create an aesthetic development program in accordance with the tastes, requests, and capabilities of the client. For example, to trace the development of various aspects of the Gothic style from the Middle Ages to the present day.
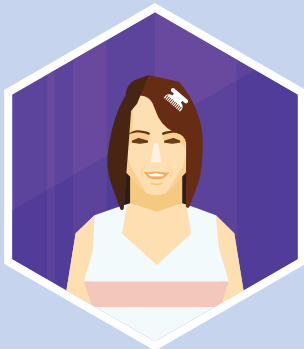
CROSS-PROFESSIONAL SKILLS

CREATIVE STATE TRAINER

A specialist in mind fitness who can bring people of creative professions into a "state of flow" and other states characterized by increased creativity. He or she is also developing their awareness, as one of the artist's important tasks is to constantly rethink reality.

CROSS-PROFESSIONAL SKILLS

CURATOR OF COLLECTIVE CREATIVITY

A specialist who organizes art groups to implement a specific creative project. These art groups may include artists of various profiles, scientists, programmers, engineers, and specialists from other industries.
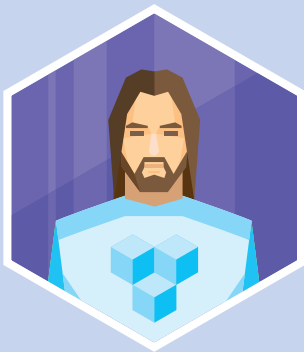
CROSS-PROFESSIONAL SKILLS

ART TECHNOLOGIST

A specialist who helps a science artist with a scientific and technical part, an intermediary between science and art on behalf of science.

CROSS-PROFESSIONAL SKILLS

CURATOR OF HUMAN-MACHINE CREATIVITY

A specialist who organizes human-machine art groups and helps them collaborate more productively. There are already robots and neural networks that draw, compose music and poetry. Their style is quite different from the human one, and in combination with the works of artists, interesting and paradoxical works can turn out.
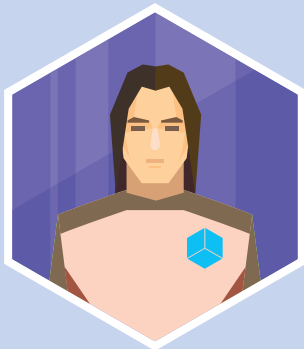
CROSS-PROFESSIONAL SKILLS

VIRTUAL MUSEUM CURATOR

A specialist who, with a team of designers and programmers, works on aesthetics and usability of a virtual museum, monitors the digitization of cultural objects, comes up with virtual tours and multimedia projects, etc.

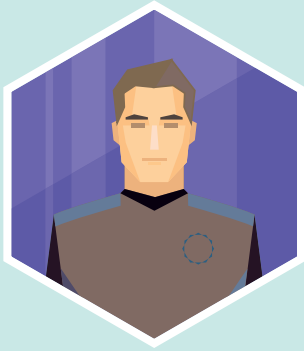**CROSS-PROFESSIONAL SKILLS**

MOBILE ART GUIDE DEVELOPER

A specialist who develops mobile applications that help people get acquainted with art. First of all, there are audio guides and applications with augmented reality, which allow you to arrange rich, self-guided tours (such as Klimt Paintings Tour around Vienna by GPSmyCity).

CROSS-PROFESSIONAL SKILLS

INTERACTIVE BOOKS PUBLISHER

A specialist who invents and oversees the creation of interactive e-books with multimedia elements and a non-linear narrative.

CROSS-PROFESSIONAL SKILLS
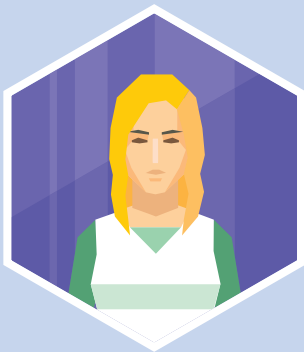
CONCEPT ARTIST IN COMPUTER GAMES

Computer games are increasingly considered a full form of art. There are concept artists in game design now, but the demand for them will grow, and their status in the art world will increase.

CROSS-PROFESSIONAL SKILLS

EDUCATION

Nika let go of the ears of the roborabbit. It soared into the air and disappeared, leaving the girl alone in the light corridor with quasi brick walls decorated with light. Wide windows looked onto the football field, across which children in red and white wear loudly rushed about with noise. A holographic display above them highlighted the score. The Reds were leading 3:1.

A young woman flashed along the corridor and told Nika on the run:

"Come on, Peskov is already vaticinating!"

"Who is Peskov?" asked Nika in confusion.

"Who? Fedor Peskov, the career strategist. Who else?!"

She tagged her phone onto the scanner on the door and let the girl go forward.

Nika found herself in a small room resembling a command center. At a row of desks sat about a dozen people peering intently at monitors. Wide plasma display panels on the walls showed the same picture from different angles: a strict, thin man was saying something in front of a group of teenagers and older people, probably their parents.

"Though it is just a rehearsal," said the man. That very career strategist Fedor, Nike guessed. "Take it seriously. The cross-professional skills challenge, or soft skills test, is one of the most important in education. Its results will affect the future prospects of the graduates."

"And how can one study up?" A tired woman of about forty came out. "Maybe there are some exam papers? A list of questions?"

"We didn't receive even a textbook recommendation," remarked a teenager next to her.

"The test's idea is in the students' reaction to controversial situations," answered the career strategist. "The correct answers depend on the context, and the format is constantly changing and being finalized.

"And how then do you evaluate the results?" snapped a youthful brunette, looking up from her smartphone. "Do you intuitively place points?"

Someone next to her chuckled.

"Of course not," Fedor smiled. "For evaluation, we have a specialist — a knowledge validator. He makes sure that not only simple parameters, such as IQ, are taken into account, but also others: emotional intelligence, systemic thinking, teamwork skills, and all that will be useful to children in the future."

"And if somebody fails the test?" asked a freckled mother hugging the similarly flecked-faced son.

"The test is important, but poor results will not put an end to a career. Soft skills are evaluated regularly, and the data is updated. Our task is to set the development vector and not to bind the youngsters."

"Oh," grunted a tight, tall man. "It's just a game! As if they don't play at home."

"For every subject, we choose the optimal format. Students took a biology test in virtual reality, for a social science test, they did a joint project. When evaluating soft skills, it is important to see the skills together. Therefore, a role-playing format was chosen."

The "command center" came into motion. The career strategist ended the conversation with the parents, and a woman with long braids rose from the table.

The display image changed. Now, they showed her friendly face.

"Good afternoon," she smiled at the camera, "my name is Polina Kychakova. I am your game master." One of the panels switched the channel, and Nika saw groups of teenagers peering at the monitors. "Today, you are a spacecraft team. The Federation sent you on an expedition along with other alien races. The main task is to test five planets for colonization suitability, but each participant will have their own individual task. Tutors will provide you with more details."

The guy to the right of Nika ordered into the microphone: "Tutors, come to the stage."

The display image changed again and broke into many sections. Each camera now showed small enclosed nooks. Teenagers in small groups of seven to ten people entered them. The same images were displayed on computer monitors. Nika moved closer to one of them.

A short woman came up to the guys, shaking hands and smiling broadly. "Do not worry so much!" She said cheerfully. "Remember, it is equally important to complete both tasks. The team task is to find out whether the planet is suitable for colonization. And the individual tasks have already been sent to your smartphones. Do not forget what we talked about. Team up, negotiate and share information. Gosha," she turned to a tall, fair-haired boy, "the team's success is good, but remember about your personal task. Vera," the tutor looked at a short-haired girl in a sweatshirt, "pay attention that your task can be performed only in pair."

The woman found a young man huddling in a corner. He did not come off the smartphone and nervously bit his nail. "Lesha, conflict is sometimes useful. Do you remember?" He nodded and immediately glued himself back to the phone.

"Dear colleagues," a voice simultaneously sounded from the "command center" and from the monitor. Nika looked around and saw a gray-haired man next to the microphone. "I remind you that all communications in the game should not go beyond the ethical framework. Be polite, open, avoid manipulation, and pressure."

"Ten, nine before the start of the game …" the game master began to count. Nika saw how all the members of the team stretched out. In the descending silence, laughter and whispering of worried children sounded distinctly through the speakers. The game started!

Fingers clattered on keyboards, and graphics started running on monitors.

Nika returned to her teens. The tutor was gone, and an Afro-American man in a mantle took her place.

"My name is Agh'Aloun," the man said in a solemn tone. The fair-haired boy, Gosha, giggled, but the man calmly continued, "I am a colonization adviser and will convey to you the will of the head of the Federation. A good expedition to all of us!"

At first, the guys looked at each other. Here and there, laughter was heard, uncertain questions, and suggestions.

"Remember that the expedition takes forty-five minutes," said Agh'Aloun. "Perhaps you want to…"

"What is there to discuss!" interrupted Gosha, going to the center of the room. "First, we carry out team tasks together, and then we go for our individual tasks."

"Okay," Lesha said, still glued to the phone.

"You can do whatever you want," Vera snorted, "but I'll do my individual task first."

"Then me too," Lesha changed his mind.

"Why do you decide for everyone? Let's allocate the responsibilities!" the rest of the guys jumped up from their seats. Such a boom noise was in the room that Nika could not make out individual words.

"The party has started," the guy sitting at the monitor joyfully commented. "Polina, this is fun."

The game master nodded, not looking up from the tablet. Her fingers ran continuously on the keys. She followed, it seemed, each of a dozen rooms, giving instructions to both colleagues in the center and those who were with the guys.

"Press on them here, Kesha," she commanded abruptly into her earpiece. "But not too much, we want to help them and not harm them."

To her right, two men watched the ever-changing schedules. The "Overcoming Stress" and "Creative Thinking" parameters were off the scale.

"Watch how Terentyeva copes with the load!" one of the men admired, but the second only shook his head.

"To get a good grade, she needs to put less pressure on classmates. And she too often takes responsibility for someone else's task …"

Nika returned to her group's monitor again. The guys stopped arguing and animatedly discussed something.

"Done!" Gosha exclaimed triumphantly and pressed the icon on the phone. "I've sent data on the last planet."

"Perfect," said the game master into the earpiece. "Your turn, Agh'aloon."

The Afro-American man got up and clicked, pretending to be viewing data from the tablet.

"Good news from the Council," he said to the guys. "They accepted the data. You did it ahead of time and can fly to another planet. For the sixth planet, you can get extra points. Or," he looked around the students, "go to the neighboring system to capture the anomaly …"

"But that …" Gosha turned pale. "This is my personal task … And if we go to both destinations?"

The man shook his head: "Choose."

"Oh, what to think," Vera shrugged. "Gosha will give in for our team task. He is alone, and we all will gain more points."

"Probably," Gosha said. "I will pass the test if … This is good for the team!"

"No," Lesha said quietly. "It's not fair."

The guys argued again, but Lesha suddenly got up and said loudly: "We are flying to look at the anomaly. Gosha himself spent all his time on other people's tasks!"

"Oh," said Polina from the command center. "Well done, Agh'aloon!"

The teams coped with the task one after another. Exhausted but happy teenagers left the rooms after their mentors.

"That's it," Polina breathed as the last of them disappeared from the plasma screens. She took off her headphones. "Congratulations to all!"

The command center exploded with applause. People clapped each other on the shoulders, chatted cheerfully. The monitor screens went blank, tablets and microphones were removed until the next time. Only two men still watched charts and scales.

The door opened, and the career strategist entered the "command center," smiled at his colleagues, and headed to the men.

"Well, what do we have here? Do we have a preliminary assessment?"

"Look," one of the men tapped the keys, and a summary table popped up on the screen. "Almost all, one way or another coped with the tasks. But the ethics of communication is sagging among these guys." He highlighted those who had the "Non-violent communication" indicator glowing yellow. "And they are all from the same class."

"Yeah," the career strategist made a note. "We will work on this. What else?"

Nika came closer, watching the men sorting out the results of the game. One of them must be a knowledge validator explaining what these indicators meant, while the other two offered solutions on the go.

"Leontiev needs to express training on attention management, and to Kharitonova, we will recommend a cross-cultural communication club…"

"It's a pity there wasn't such a thing before." Nika could not stand it.

The men turned to her. The girl was embarrassed, but the career strategist only smiled.

"That's for sure. In schools of the XX and first quarter of the XXI century, theoretical knowledge was mainly tested."

"And what? Was there any chance at all?" Asked Nika with desperation. She was so envious of these children. Their teachers were not pushing with exams and the need to choose right now. She, perhaps, also needed to take a course of non-violent communication!

"Why," the career strategist shrugged. "Soft skills could be trained before. I trained them on the street, "he grinned. "And Ruslan," he nodded at one of the men, "participated in projects and DIY clubs."

"And how did you understand what you want to do?"

"Do you know who I am? Designer of educational trajectories," Ruslan responded. "In my childhood, one could not imagine such a profession."

"And what did you do?"

"I tried everything I could reach for. I watched what I liked and what not. I studied to become a psychologist, and in my spare time, I programmed. So I got a mix."

"You have tried everything…" Nika uttered with thoughtfulness. In the corner of the command center, the roborabbit was impatiently jumping up and down, but the girl was in no hurry to meet it.

"Only you can understand what you want to do," said the career strategist. "And still, the work will change ten more times. Okay, what's up with Ignatov?" he returned to the monitor.

Nika went to the restless robot.

"You know what?" she said, taking hold of its long ears. "Enough. It's time to get on with my own life. I still have to try everything."

TASK

Come up with similar stories based on the following cases, a vision of the future, and a list of emerging jobs at the end of the chapter. In the process, try to answer the following questions:

● How many different specialists do you need to complete a task?

● What might a room where heroes work be like?

● What conflicts and surprises may arise during work?

Send your stories to: atlas30@atlas100.ru. The best stories will be published on the Atlas of Emerging Jobs website, and the winner will receive a prize!

Case 1. It is necessary to make a fascinating online course on game theory for students and figure out how to evaluate their knowledge after taking the course.

Case 2. High school students are doing a collective project on the colonization of Mars. Conflicts arose in the group because two students at once want to be leaders and compete with each other. Who will resolve the situation, and how?

VISION OF THE FUTURE

Education is traditionally considered a very conservative field, but the development of technology is changing approaches to knowledge acquisition and redesigns the usual educational process. This means that in the future, education specialists will be in great demand.

Firstly, IT-based learning tools are beginning to be used: online courses, simulators, online gaming worlds. This provides new opportunities: students not only gain the necessary knowledge but also develop the ability to work with information.

Secondly, due to the rapid development of technology, the emphasis in preparing for adulthood is shifting from narrowly specialized skills — "hard skills," which now have to be regularly updated, to cross-professional (including soft) skills — empathy and communication skills, IT skills, creativity, etc.

Schoolchildren and students will be taught to enter into productive states of consciousness that allow them to concentrate better and solve complex creative and analytical problems. For example, in a state of flow, when a person is fully involved in the creative process and does not experience anxiety about possible success or failure.

In addition, new technologies allow us to make education more individual. There is no longer any need to adapt to the general schedules and wishes of the group. Now, the learning process can be adapted to the needs of a particular student and his characteristics. You can choose the format of training and its pace, concentrate on a narrow topic or, conversely, go through a unique interdisciplinary program. Distance no longer matters.

Courses of many prestigious universities can now be studied online from anywhere in the world. In the future, distance schools and universities will become an equal alternative to traditional full-time education, and online tutors will oversee the educational process and help students master the program. In Russia, the University NTI 20.35 does important work in this area.

Game formats of training will be increasingly used since games are the most organic and motivating way for a person to learn something. In addition, problem-based and project-oriented training will be introduced that stimulates independence, the ability to set goals, take responsibility, reflect, and focus on action.

Collective competencies are also needed to be developed because more and more complex problems are solved in teams with people of different ages, personality types, with different ethnicities and cultural backgrounds. Accordingly, it is critically important to train people to understand each other, negotiate, and cooperate. It will be necessary to create educational spaces (including virtual and augmented reality) for cross-training and mentoring support.

Training materials will be divided into minimal blocks of knowledge (knowledge bites), and out of them, training courses and programs that are suitable for specific tasks will be built. Such a breakdown increases the availability of training and helps to get in the groove of it because knowledge can be acquired in small portions. At the same time, it is also necessary to solve the opposite problem — to build "knowledge trees" from knowledge, skills, and competences that are complexly interconnected.

The world is changing so fast that we can no longer afford to study theoretical disciplines for five years, and then learn the profession for some time at the expense of the employer. Therefore, education, especially for university students and adults, is becoming more practice-oriented. And this means that the emphasis is shifting from theory to students' real projects, including their startups. At the same time, the prestige of new working professions is growing, since they remain in demand, but they are far from the traditional image of a "worker in a stained apron." Due to the influence of technology, the requirements for secondary vocational education are also changing: today's milling machine operator would have been considered an engineer 50 years ago because he performs complex tasks related to programming a modern machine.

In today's fast-paced world, it is necessary to bring the competencies of workers in line with the needs of employers, given the constant

updating of functionality in professions. Therefore, training formats are developing in which a student can simultaneously learn and work.

New knowledge assessment systems will be created:

a) to evaluate not only formal knowledge but also the independence of thinking, and creative, communicative abilities, etc.;

b) to constructively impact the lives of people, providing valuable and encouraging feedback;

c) to reflect the entire diversity of human activities (ideally compose some kind of continuously updated "skills passport," including a variety of activities, consisting of biofeedback and social networks).

Educational institutions will have to change formats, as standard curricula become too bulky and inflexible, and lectures can be read online. Schools and universities will be transformed into educational hubs, where students can receive the educational experience of various durations, intensities, and different learning styles.

Educational ecosystems are emerging, developing communities of representatives of schools, universities, circles, etc. Within the framework of such an ecosystem, it is possible to quickly and efficiently respond to all students' requests, providing them with the necessary formats and programs. Educational ecosystems can include both real and virtual spaces, providing an opportunity for individual and collective development. In addition to education providers, intermediaries will be needed here who will pool resources, build educational trajectories (a kind of learning routes), and give students feedback.

More and more advanced pre-educational gadgets for children are being developed — games, consoles, robotic toys containing educational elements. A good example is Cognitoys' Dino Smart (Smart Dinosaur) toy for children. It is connected to the artificial intelligence of IBM Watson and teaches language, numeracy, and other useful skills.
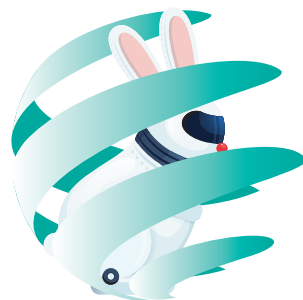
CROSS-PROFESSIONAL SKILLS

1. Systems thinking

2. Cross-industry communication skills

3. Project management

4. Lean production

5. IT

6. Customer focus

7. Multilingualism/ Multiculturalism

8. Social skills

9. Working in uncertainty

10. Art and Creativity

11. Ecological thinking

EDUCATIONAL TRAJECTORY DEVELOPER

A professional who creates a training route for new specialists. The route consists of courses offered by educational institutions (including those available online), as well as simulators, internships, etc. Based on them, an educational trajectory is developed. Moreover, in its construction, a personality type, abilities, and goals of the student are taken into account.

CROSS-PROFESSIONAL SKILLS

CAREER STRATEGIST

A specialist who informs students and teachers about the needs of employers, helps to formulate professional goals (both short-term and long-term), and builds an educational and career path that will lead to students' achievement.

CROSS-PROFESSIONAL SKILLS

PROJECT-BASED LEARNING ORGANIZER

A specialist in the formation and organization of educational programs, in the center of which is the development and implementation of projects from a real sector of the economy or the social sphere, and theoretical material only provides information in order to complete a project.

CROSS-PROFESSIONAL SKILLS

TUTOR

A teacher who accompanies the individual development of students in the disciplines that form an educational program. He or she answers questions, develops individual tasks, recommends a career path, etc.

CROSS-PROFESSIONAL SKILLS

GAME MASTER

A specialist in the development and organization of educational games (business, historical, science fiction, etc.), and maintenance of games using simulators. The educational potential of games was studied in developed countries from the beginning of the 2000s. In recent years, gamification (the use of game mechanics in non-game processes) has become a noticeable trend. In Russia, the direction of educational games is supported by the Russian Association for Educational Games.

**CROSS-PROFESSIONAL SKILLS**
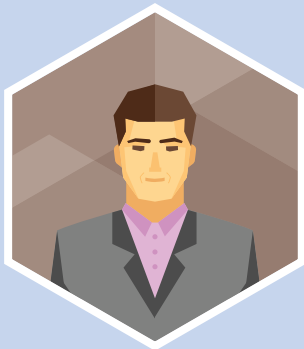
MODERATOR

A specialist who organizes group discussions or collective creative projects. His task is to establish communication between participants and build the process in such a way as to obtain maximum effect. He or she can work both offline and on online platforms. Moderators are also actively used in Russian education; for example, most of the educational programs of the Moscow School of Management Skolkovo are accompanied by moderators.

CROSS-PROFESSIONAL SKILLS
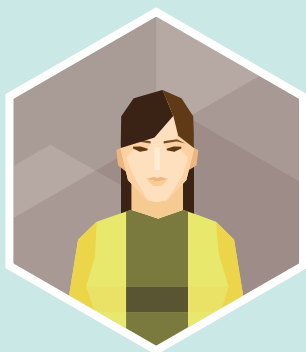
EDUCATIONAL CONTENT UNPACKER / PACKER

A specialist who breaks down training materials into minimal blocks of knowledge in order to collect training courses and programs suitable for specific tasks from them. This specialist also solves the inverse problem: builds "trees" from related knowledge, skills, and competencies.

CROSS-PROFESSIONAL SKILLS

ONLINE EDUCATION PLATFORM COORDINATOR

A specialist within an educational institution or on an independent educational project who helps teachers prepare online courses in specific subjects or disciplines, organizes and promotes specific courses or typical educational paths, moderates the communication of teachers and students within courses or platforms, and sets the requirements for finalizing the platform's functionality. In some Russian universities, whole units have appeared that are responsible for these functions. For example, at Moscow Institute of Physics and Technology, there is a laboratory of innovative educational technologies, and at the Higher School of Economics, there is the Center for the Development of the Educational Environment. This, in particular, allowed universities to develop their online courses for the Coursera platform.
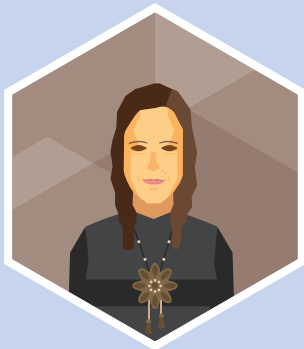
CROSS-PROFESSIONAL SKILLS

TEAM COMPETENCIES TRAINER

A coach specializing in developing skills for productive work in a group: emotional intelligence, building boundaries, assertiveness, non-violent communication, efficient distribution of roles and tasks within a group, etc.
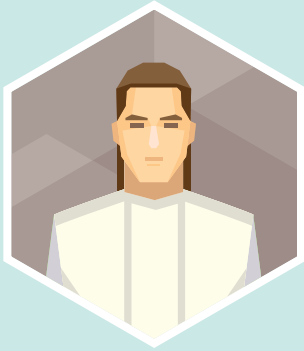
CROSS-PROFESSIONAL SKILLS

EDUCATIONAL ECOSYSTEMS ARCHITECT

A professional who manages open communities of various education providers and helps them coordinate the work of educational institutions so that it meets the current needs of students as much as possible.

CROSS-PROFESSIONAL SKILLS

EDUCATIONAL INSTITUTION MODERNIZER

A specialist who turns schools and universities into educational hubs that provide learning opportunities in different formats, styles, and lengths. Education is becoming less standardized and more variable, so the task of educational institutions of the future is to look for different ways to educate people, depending on the desired result.

CROSS-PROFESSIONAL SKILLS

# KNOWLEDGE VALIDATOR

A professional who develops new systems for assessing knowledge and skills that allow evaluating the student's abilities in a wide range of parameters (including independence of thinking, adaptability, communication skills, etc.) and providing developing feedback. Ideally, such systems should reflect the full diversity of activities and competencies.

CROSS-PROFESSIONAL SKILLS
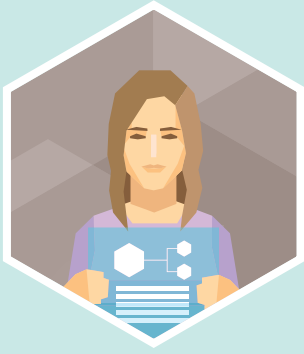
CHILD FUTURE LIFE ADVISOR

A specialist in the formation of a possible way of the future life of the child and the trajectory of his development. The vision is based on the desire of the parents, as well as the abilities and ideas of the child. The expert will select educational programs (creative, sports, etc.), educational games, and computer programs that help the child learn the necessary skills.

CROSS-PROFESSIONAL SKILLS
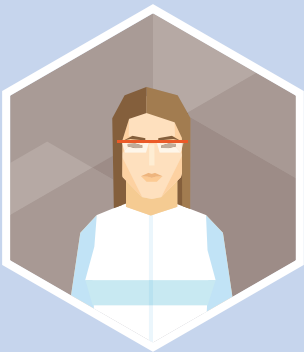
STARTUP MENTOR

A professional with experience in launching his own startup projects. He oversees teams of new startups, trains them on how to conduct entrepreneurial activity on the example of his own projects. Mentorship programs now exist not only in business incubators and accelerators, but also at large universities, and the latter combines the functionality of business mentoring and more traditional mentoring: successful graduates give students advice on the first steps in their careers, whether their business or work in a large company. For example, MSU, the Higher School of Economics, and the Russian Economic School have such programs.

CROSS-PROFESSIONAL SKILLS
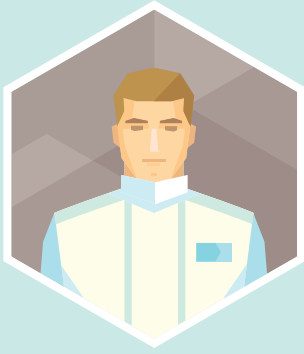
ENVIRONMENTAL PROPHET

A specialist who develops and runs educational programs devoted to a more environmentally friendly lifestyle (refusal from excessive consumption, separate collection of garbage, an environmentally conscious lifestyle, etc.), and programs on more environmentally friendly practices for manufacturing enterprises.

CROSS-PROFESSIONAL SKILLS

GAMES EDUCATOR

A specialist who creates educational programs based on game pedagogy techniques and can take up a game character role. In schools, these specialists can replace the traditional teacher. In Russia, there are already developed traditions of game based learning in schools. The penetration of school games is mainly limited by the regulatory framework.

CROSS-PROFESSIONAL SKILLS

For enrollees

For students

EPILOGUE

The specks of sunlight were flashing before her eyes. Nika was standing among the bushes of a blossoming rosehip. There was a strange massive building nearby. What is this, some kind of history museum? Who's building a museum like this now? Narrow windows, heavy columns. Still, there was something vaguely familiar about it, too. Stop! This is the law school. The girl turned sharply towards the robot bunny.

"Did you really bring me home?"

She looked around. No drones in the sky, no electric cars on the street. The rabbit went higher, buzzing.

"Wait! " Nika exclaimed, but he soared up and vanished into the spring sky.

For a few seconds, the girl stood still looking into the clouds. That's it, isn't it? She gasped and pulled out her phone. Well, how long has it been? Mom and Dad must have called the police already! But the smartphone was showing 11:20, May 13th, 2020. No way! It has been less than five minutes since she met the rabbit.

The girl looked into the sky for the last time and rushed back into the auditorium. The last thing she wanted was an earful from her parents. She'll think about the rest later.

The presentation in the auditorium was ongoing. People in jackets were still talking dully about their "stable and confident future".

"Where have you been?" Mom frowned. "It's such a nice presentation. It's a very decent place…"

Daddy was absorbed in his smartphone. Nika looked over his shoulder — he was playing Candy Crush.

"Igor!" Mom hissed at him.

"Yes, I agree, very decent," echoed Dad, destroying a line of candies.

"Do anybody in the audience have any questions?" A woman in a narrow jacket approached the audience with an air of importance.

"How are you planning to compete with algorithms?" Nika shouted all of a sudden.

The audience was taken aback. The girl received the microphone.

"Why would we have to compete with algorithms?" The woman was surprised. "Human capacities are irreplaceable and…"

"You say, your alumni will advise people. On… I don't know, the laws. They will fill in papers, write applications. What's irreplaceable about that? It's a straightforward job, according to the template."

"My dear, there's a lot you should know… the administrative code, the criminal code, the labor code," said the woman.

"Wikipedia knows more," Nika shrugged. "Upload your codes to the neural network and go."

"Oh, this is ridiculous," the woman laughed nervously. "I'm glad our future applicants have such a rich fantasy, but let's stay down to earth. Ahem… Any other questions?"

Nika frowned and sat back into the seat. Listening to the university representatives was a complete waste of time.

"Dad, look, there's a line of five candies," the girl whispered.

The torment lasted another half hour, but it seemed to last forever!

"Are you out of your mind?" Mom asked the moment they were out of the auditorium. Nika's back was whining from her uncomfortable back; Dad yawned without hiding. "Algorithms, networks… They told you everything!"

"I just realized something," the girl smiled. "I don't want to be an actress anymore."

"Thank God!"

"I don't want to be a lawyer either."

Mom stood still and looked at her daughter very attentively.

"Okay. Not a lawyer. But who?"

"I don't know," Nika shrugged. "I'll try different professions, take a few internships. I will attend the clubs. I'll figure out what I like better, and I'll develop a career strategy."

Dad took his eyes off his smartphone and looked at Nika with sincere interest.

"A strategy, right?"

"Yes! I'm after a complex approach. I want to understand what I like. Then, I want to know how this or that job really works and what I want to do there."

"And when do you plan to make up your mind?" Mom asked with concern. "In two years, you'll have to enter a university… You'll have to pick the subjects for your state exam and get prepared."

"I' m not planning to make up my mind at all," Nika smiled. "If I get bored with one thing, I'll do something else. Do you know how many jobs people will change in the future? Dozens!"

"Have you been kidnapped by aliens today?" Dad smiled.

"Sort of," Nika smiled back.

A group of teenagers came up to her — a freckled boy and two girls.

"Hey!" said the boy. "It was cool to see you wind up that lady."

"Yeah, I was thinking about what you said, — one of the girls said.

"Listen, you…" The boy got slightly confused. He looked over at the girls.

"Can you tell in the future?" I asked the other one. "You know, like, neural nets, robots, drones."

"Well… I think so," Nika replied.

"Cool! Do you want to join us? You can tell us what to do in the rise of the machines."

"Olesya meant, in the future," the first girl corrected her friend.

Nika looked at her parents.

"You can go," Mom nodded. "And tonight we'll discuss your… strategy."

They exchanged mysterious glances and went to the exit. Nika waved goodbye.

"Anyway," she turned to the guys. "In the future, people will work in versatile teams and solve non-standard tasks … Artificial intelligence will help them. Therefore, it is very important to be able to communicate and think creatively; in addition, one should be able to program."

"Are we going to fly to space?"

"Of course! Both to the moon and to asteroids. Orbital stations will be visited by tourists at least every week. As long as the garbagemen don't let them down," the girl smiled at the memories.

"Garbagemen? In space?"

"You have no idea how much garbage is flying there! First, it's spent rocket stages. Second, it's the debris from exploded satellites—"

The rabbit robot flew somewhere high above the building, buzzing happily.

CONCLUSION

CAN WE REALLY PREDICT THE FUTURE?

Bruce Sterling, a famous cyberpunk writer, believes that futurology is dead because the world is changing too fast, and these changes are impossible to predict. This is true when you take forecasts as guidelines for action, with solid guarantees. There are plenty of examples when predictions and prophecies never came true. At the beginning of the twentieth century aviation enthusiasts promised that every family would have their own plane; in the middle of the century, it was expected that cars with nuclear reactors would drive everywhere, that coffee machines would run on nuclear batteries; while in the 1970s it was a widespread belief that at the beginning of the XXI century people would inhabit Mars and the satellites of Jupiter.

However, you can think about the future not as a person who wants reliable guarantees, but as a person who goes on a challenging journey. The fact that Columbus came to America was a surprise for everyone. In some ways, it was even a failure, given that his destination was India. But does that mean Columbus shouldn't have planned his journey or shouldn't have studied the maps or examined the currents and meteorological conditions? That he shouldn't have developed a route or built a team of people with the right skills? Purchased an astrolabe?

Of course not. The map, the weather forecast, the team, and the astrolabe are of help in the journey, even if it is full of surprises. This metaphor can be applied to everyday life as well:

- we should think about where we want to go in the first place;

- we should assess what are the best routes to get to the future we want (they may change as we go; thus, you may have to devise an up-to-date Plan B);

- we should see what currents are flowing in the same or in the opposite direction (i.e. we should be aware of the trends forming the future);

- we need to understand what tools we need to travel (these include specialized expertise, generic skills, overall mental framework, awareness, and psychological preparation);

- and of course, it is essential who our fellow travelers are because we can help each other get where we want to go.

In addition, there are many examples of very successful predictions alongside failed forecasts. For example, modern technology developments in Japan and South Korea are rooted in scientific

predictions, whereas the founders of the famous Silicon Valley in the U.S. not only predicted the era of personal computers and the Internet but also managed to profit from them. Successful predictions are based on an accurate understanding of what social and technological processes (trends) in the present are changing the world around us, creating our future.

KEY TRENDS TRANSFORMING THE WORLD OF WORK

To find out how the work is changing, you need to understand the factors that will affect it. These are the most critical of them.

DIGITALIZATION

Digitalization, i.e. the conversion of all types of information into digital form, is pervading every sphere of activity. It changes the approach to managing enterprises, cities, and our daily lives.

In the physical world we are used to, we cannot create an accurate copy of an object. What we can try to do is to make it as close to the original as possible.

We are creating a new dimension of reality in which data about the outer and the inner worlds (images, music, heartbeat, itineraries, etc.) are transferred to a uniform format consisting of zeros and ones. Data in analogue formats deteriorate over time (book pages decay, photos fade), whereas digital data can be stored without loss of quality for as long as its carriers will last. For digitized information, there is no difference between the original and the copy, and the copies are created with a minimum use of resources. Digital information is easy to analyze by comparing an unlimited amount of data coming from billions of devices in a common digital format. New challenges are also emerging, though — we are revisiting our ideas about privacy, copyright, memories, and many other things. We have not yet fully understood what it means to live in a digital world. It is the digital natives, those who were born and raised in the digital world — who are most likely to teach us this.

AUTOMATION

Automation began in the XIX century when mechanisms first appeared, but today this process has accelerated dramatically. This is more than just the spread of robots which fulfill mechanical tasks. By means of artificial intelligence systems, routine intellectual work is also automated; for instance, in the selection of airline tickets, writing simple texts, airport ads, etc.

As estimated by researchers from Oxford Martin School's Program on the Impacts of Future Technology, within the next 20 years, up to 47% of existing jobs in developed countries may be replaced by robots and computer algorithms. This does not mean that people will lose their jobs completely — they will do what robots cannot do. A large part of human work will become creative; therefore, the ability to create will no longer be the destiny of secluded creators but will become a mass phenomenon.

Moreover, more and more professions will be associated with teamwork. People will work less with machines and more with other people. Therefore, one of the important (and widespread) skills will be the ability to organize work with individuals and teams.

In a world full of automated systems, computers and robots should not be our competitors, but our helpers. Anyone will have to be able to customize robots and artificial intelligence systems for the tasks needed. Computer literacy, as we understand it now, such as the ability to use an Internet browser, send an e-mail or write texts using a text editor, will be an indispensable skill but not sufficient for work. The world of the future assumes that nearly every employee will have at least basic programming skills. Nowadays, programming is beginning to be an integral part of the standard training for workers in industrialized countries, since most of them use CNC equipment (that is, computer numeric control machines).

GLOBALIZATION

Globalization has long been part of our reality. In most countries, you can buy world-known brands of clothes or electronics, as well as eat at famous fast-food chain restaurants. However, this process lies much deeper than the increasing availability of goods and services.

The Russian economy, as part of the larger world, will inevitably move towards greater integration with the global economy and, at the same time, towards greater regional economic specialization. Today, it is hard to tell which country has produced this or that complex product. A computer may be labelled 'made in Japan,' but its components were supplied by three dozens of countries, and the raw materials for its production were delivered from about forty other countries. Even if we talk about a creative product, such as a cartoon, it can be invented in America, drawn in Russia, while the 3D animation for it was created in China. Therefore, employees of the future will have to be able to work in multilingual and multicultural environments, communicating with partners from around the world. Some of these partners and employees will be located in other countries, which means that the standard practices will involve not only remote work (when an employee works from home, communicating with colleagues via the Internet), but also work in distributed teams (when professionals working together may live on different continents).

In addition to speaking a foreign language, you will need to be able to communicate in international professional languages, i.e., to be aware of the industry requirements, standards, and tools. Furthermore, a significant proportion of employees will need an understanding not only of their own industry but also of their suppliers' and consumers' industries. In other words, they will need to know the language of cross-cutting communication that helps people from a wide variety of fields to work together (for instance, to a psychologist, musician, and programmer working together on a new "sound SPA" technology for relaxation).

GROWING DEMAND FOR SUSTAINABILITY

Up to a certain point, ecology was perceived primarily as a restriction on economic activity aimed at maintaining a clean environment. "Green" skills were only desired for those who worked in the field of nature conservation or waste management.

We are now witnessing a shift towards a more holistic understanding of the Earth's ecosystem and the role that humanity and the technologies it creates play in the evolution of the biosphere. Ecological thinking is being integrated into virtually all spheres of life.

Ecological thinking is more than just using clean water or farm products. To a much greater extent, it implies an environmentally friendly approach to all types of natural resources used (e.g. reducing energy and water consumption, an efficient use of raw materials) as well as reducing the amount of waste produced (e.g. by recycling waste, using biodegradable materials, etc.). Environmental thinking suggests that we all understand that natural resources are not limitless and that we are responsible for the place we live — be it our home, city, country, or planet. Therefore, the skills of environmentally responsible behavior will, in the future, become part of the standard training of any employee. More likely, they will be taught in the family and since primary school, becoming the same standard for any adult as reading and writing skills.

DEVELOPMENT OF NETWORK ORGANIZATION IN SOCIETIES

The term "network society" was proposed in the 90s by European sociologists Jan van Dijk and Manuel Castells. They predicted that the rise of network communication technologies would radically change the structure of society and the way of life of each individual.

In a networked world, there is no longer a need to stay in an office from 9 AM to 5 PM and work for the same company. More and more people are becoming freelancers.

Digital platforms have transformed labor markets, from that of programmers and copywriters to plumbers and babysitters, providing direct access to the customer. The feedback system helps build trust and practically eliminates the need for centralized regulation.

A new engineering culture is emerging in the networked world. Makers benefit from new technologies and create amateur projects. Some of them become prototypes of new industrial products.

More and more people choose to work for themselves and become entrepreneurs, while the internet helps them promote their products or enables them to convert to the digital economy fully. The workplace of the freelancer and entrepreneur may be located in their own living room or a cafe with wi-fi, anywhere in the world. Others prefer to work in a coworking, where they get access to office infrastructure for a modest fee and, more importantly, find themselves in the company of like-minded people. An excellent example of modern coworking is Tochka Keepeniya (the Boiling Point) network (http://leader-id.ru/points).

One of the key elements of the new network culture is games. It is estimated that 2.2 to 2.6 billion people play various video games.

The process of gamification has long gone beyond the entertainment industry and now affects all areas of life — from education and relationships to career building. Games, unlike most other forms of cultural broadcasting, have an important characteristic that reflects one of the key values of a network society: they are interactive, involve active consumer participation, and invite creation.

Old hierarchical management systems hardly survive in a network society. They are now replaced by new forms of communities and teams, more flexible, adaptable, based on personal responsibility for the overall result rather than on work by the book. In the corporate sector, this trend is manifested through the adoption of new management schemes.

- Agile management is an approach that implies flexible project management. It uses a series of prototypes to create a working product. Agile management relies on the free co-creation of participants in the process. This approach originated in the field of IT product development, but over time it has been applied in other areas as well.

- Holocracy is an organization management system in which authority is distributed through a network of self-organizing teams. The focus is on creating common rules, identifying individual roles, organizing small teams, and building synergies among them.

- Teal organizations is the approach assuming that organizations can evolve into self-governing structures. These new organizations have a mission for which they are constantly evolving (and which is usually related not only to income but also to the public good), and in which every employee contributes as much as he or she can.

New organizations and communities originate as a network of interrelated individuals and small groups, creating an environment for a complete actualization of the individual. External motivation for rewards and career development gives way to internal motivation to solve interesting tasks and implement large-scale collaborative projects for the public good.

GROWING SPEED OF CHANGE

Accelerating technological and social change is a trend that manifests itself in all aspects of our lives. While it took decades to deliver electricity since it was invented, it was a matter of a few years to make smartphones widely available in developed countries. The changes described in the Atlas will also take much less time.

Alvin Toffler was one of the first to talk about the problem of technological and social acceleration in his book published in 1970, 'Future Shock'. Toffler analyzed the negative impact of accelerating change. Change makes people feel disconnected from society; people suffer from "a devastating stress and loss of orientation"; they are shocked by the future.

Thus, humanity is facing the greatest challenge of to cope with the increasing speed of change to cope with. Both technically and psychologically.

GROWING COMPLEXITY OF MANAGEMENT SYSTEMS

The world of work of the future is complex; it is filled with flexible technological solutions and demands a constant commitment to change. It will require people who can not only navigate the world of work but also effectively manage projects, teams, and entire organizations. To meet this challenge, an increasing number of employees will need systems thinking — the ability to understand quickly how complex processes, organizations, and mechanisms operate. Through systems thinking, a person can identify and solve a problem quickly, engage in a new area of activity, and communicate their ideas to people from other industries or sectors.

WHAT DO THE NEW TRENDS MEAN FOR THE LABOUR MARKET?

David Autor , a professor of MIT School of Engineering, examined changes in the labor market and discovered the following pattern. Employment has grown in two areas: simple and low-paid tasks and, conversely, complex, and requiring unconventional thinking. In the area of routine manual or intellectual work, which was relatively well paid, employment was declining.

The reason for this is simple. It was unprofitable to automate cheap and simple work, while it was virtually impossible to automate creative work. However, it was more profitable to entrust the machines with rather expensive but easily automated intellectual routine.

The research demonstrates the future of professions vividly. The cheaper robots become, the more the red zone (the zone of falling demand) will move to the left, gradually embracing the cheap and low-skilled labor. Whereas, the scientific developments (neural networks and AI) will expand it to the right.

What will happen to the people who will be displaced by technological solutions? In industry, services, and the knowledge economy, there will be two poles: mass standardized products/services (with emphasis on automatic solutions) and customized goods and services (with emphasis on communication and non-standard tasks). Examples can be found in the table below.

The number of jobs will increase primarily in customized solutions, although some people will continue to develop and maintain automated systems. To stay afloat, one must either develop creativity and communication or be proficient in IT. A combined strategy may be used to move in both directions.
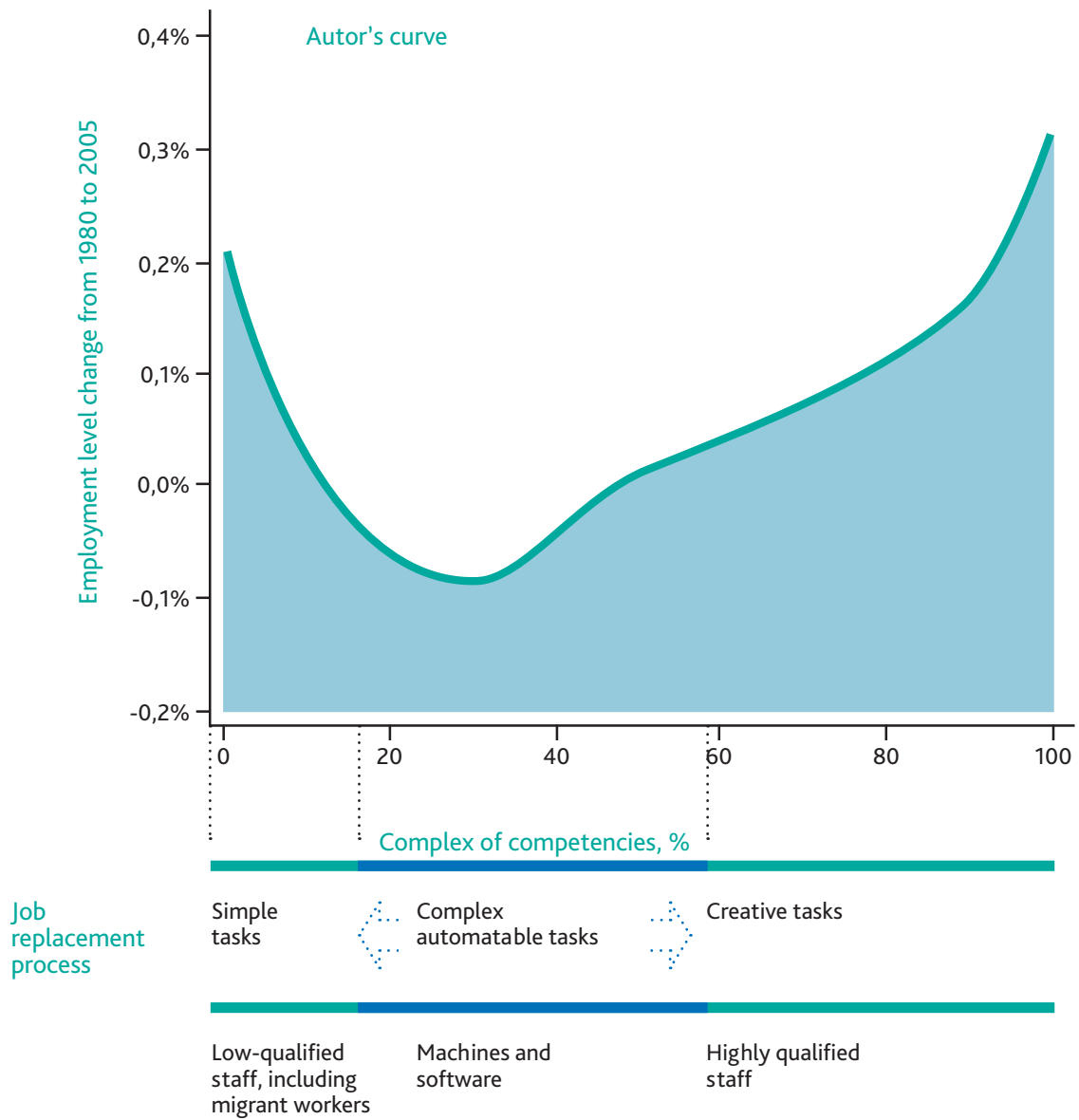
In addition, the new complex world will lack:

- professions for which skills can be acquired at a young age and will not be further taught (because the functionality of professions will change with the development of technology);

- simple work involving routine operations on a conveyor belt;

- linear hierarchy where the subordinate cannot make decisions, and the entire responsibility lies with the management;

- routine work at the computer when it is clear what and how to copy and paste;

- clear boundaries between personal and working time;

However, the new complex world will have:

- many new professions that have no name yet and will be constantly changing;

- jobs that require setting up and training in complex systems;

MEDIUM SKILLS WORKERS ARE THREATENED BY AUTOMATION

Autor's curve

Employment level change from 1980 to 2005

0,4%
0,3%
0,2%
0,1%
0,0%
-0,1%
-0,2%

0   20   40   60   80   100

Complex of competencies, %

Job replacement process

Simple tasks

Complex automatable tasks

Creative tasks

Low-qualified staff, including migrant workers

Machines and software

Highly qualified staff

	MANUFACTURING	SERVICES	KNOWLEDGE ECONOMY
STANDARDIZED OUTPUT	**Cyber-physical large-scale industrial manufacturing systems**	**Digital services with VR+AR and artificial neural network support**	**Data production and analytics**
Examples	Gigafactories, unmanned logistics, on-line sales	Mass entertainment, medicine, accounting, public sector, blockchain-based registries	Analysts, researchers, virtual assistants, neural networks for creating news content, MOOC+
CUSTOMIZED OUTPUT	**Customized end-user local manufacturing**	**Human-centered services**	**Dealing with chaotic information and complex systems**
Examples	3D-Printing, localised manufacturing, neo-craftsmanship, biohacking	Psychotherapy, tourism, fitness, health services	Scientists, social ecosystems curators, and hybrid intelligence teams

The direction of the transition of employees

- horizontal teams working as equals on a shared goal;

- jobs in virtual reality and augmented reality will become commonplace;

- an opportunity and even a need to combine creative and professional actualization.

Of course, rapid changes in a profession are a rarity associated with disruptive technologies that destroy an entire industry (for example, when motor vehicles became available, the cabmen lost their jobs). Such processes are usually slower, especially when it comes to mass employment. Firstly, because the technology spreads unevenly, for example, in large cities they tend to arrive earlier than in remote regions. Secondly, states have an interest in maintaining social stability. A study by the international company Boston Consulting Group, "Russia 2025: From Staff to Talents", reveals shocking data — Russian big businesses are ready to make about 9 million people redundant within seven years. This can cause significant social upheavals, so the government and employers are trying to mitigate the situation by keeping jobs.

Yet it is important to understand that such a safety net will not last forever, and mass professions are at great risk.

The good news is, however, that there will be no less work as new professions, markets, and whole sectors of employment are emerging. In addition, people who used to have difficulty integrating into the economic system — for example, creative individuals or those who cannot stand the office routine and flourish in situations of continuous uncertainty — will now have every chance to find themselves in a profitable profession, rather than sharing their lives at work for money and hobbies for their heart. Please find below the most important areas where the number of jobs will grow.

Creative economy

Cybereconomy

Thrivable economy

Human-oriented
services

New tech
sectors

Creative industries

Creative economy implies that the main component of production is the human imagination and the ability to create something new — music, video, scripts, storylines for a game. IT technologies will also be applied here, though.

Virtual economy

This is an industry based on value creation within the digital world, e.g. cybersports, video blogging, mass online gaming services.

Human-centric services

In response to the growth of robotization and digitalization, the need for human connection is rising. Examples include customized hairdressing shops or coffee shops, where people care about a service or product, but also about communication and the feeling that they are being cared for.
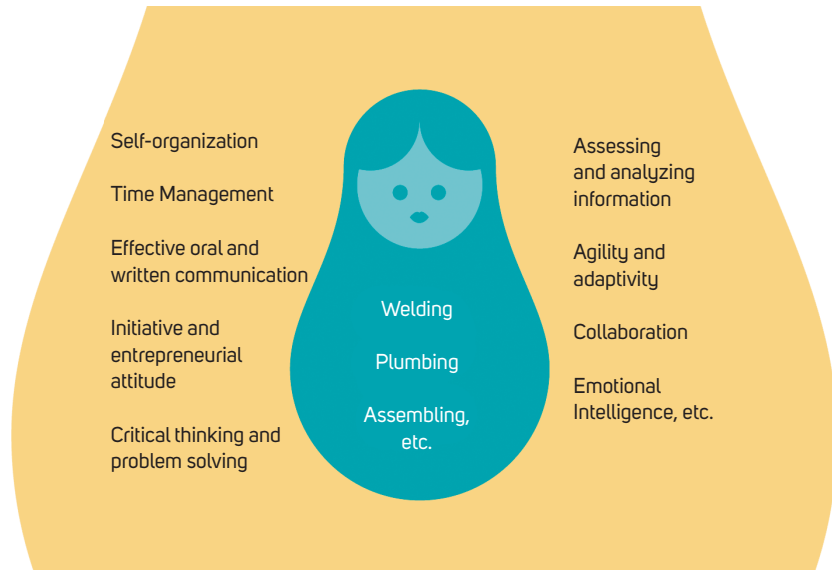
Thrivable economy

A greener approach to production and urban development creates new occupations and jobs. Perhaps this very sector will provide jobs for blue-collar workers who are unlikely to find themselves in the creative economy and, at the same time, are not ready to move to the service sector.

SO, WHAT SHOULD I DO?

In order to adapt to the new world, you will have to revise the basic principles of education. That's what the old skill model that your parents used to study looked like.

Simple skill model

- **Hard skills** (teal)
- **Soft skills** (tan)

Self-organization

Time Management

Effective oral and written communication

Initiative and entrepreneurial attitude

Critical thinking and problem solving

Welding

Plumbing

Assembling, etc.

Assessing and analyzing information

Agility and adaptivity

Collaboration

Emotional Intelligence, etc.

Source: «Skills of the future» report (WorldSKills Russia/GEF)

Basis: hard skills. For example, mathematics, programming, linguistics, engineering.

Outside (as a bonus): soft skills. For example, leadership skills, sociability, etc.

Since technology evolved more slowly, people could afford to learn a highly specialized skill set and remain in demand for years. But today, a successful professional needs a fundamentally different level of flexibility. Therefore, the previous model will have to be turned upside down.

- Context-specific skills
- Cross-contextual skills
- Meta-skills and existential skills
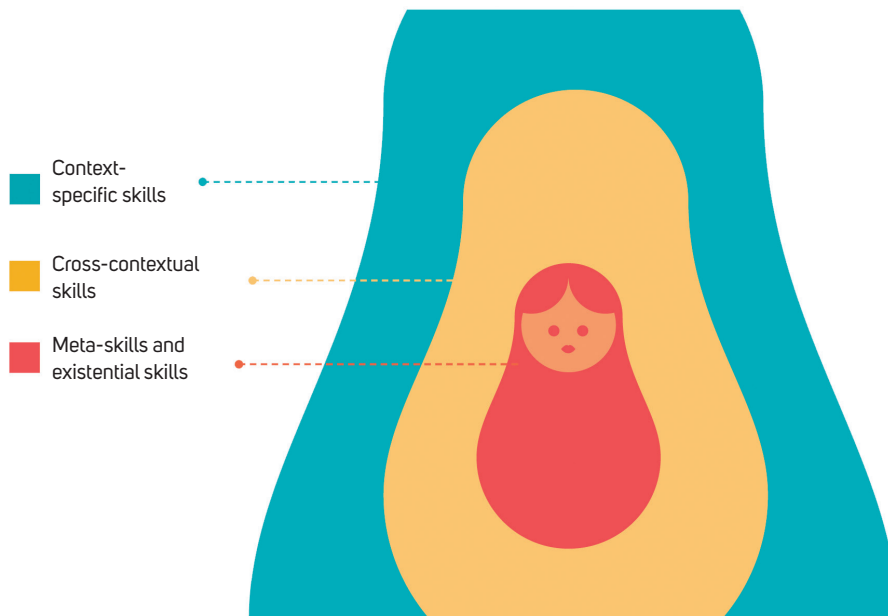
New model of 21st century skills

The top layer: context / specialized skills

Skills that are developed and applied in a particular context. Professional skills (programming in a particular language), physical skills (e.g., driving a car), or social skills (e.g. video blogging). In a new world where things are changing rapidly, these are the most superficial skills that have to be constantly updated.

Middle layer: cross-context skills.
Skills that can be applied to a wider range of social or personal activities: reading, writing, time management, teamwork skills. They need to be toned up and updated from time to time, but they will be valid in a variety of occupations.

Basis: existential skills
Skills that can be universally applied throughout life and in various life contexts of a personality. They include the ability to set and achieve goals (willpower), self-consciousness/ability to self-reflection (awareness), the very ability to learn/retrain (self-development). Indeed, we are used to thinking that specific knowledge is more important than the ability to acquire it. This worked well before when the information was updated more slowly, and the knowledge gained in the university could last for many years. But now the "treasure of knowledge" rather looks like a toolbox that has to be revised regularly to decide what tools are outdated and have to be removed, and what tools should be added for specific tasks. The ability to upgrade the toolbox becomes critical in the end.

The inner layer is the most important one, it needs special attention, and all the other layers should be built on top of it. A person who is good at existential and cross-context skills, will not fail in any situation. This will require that you abandon the model that is usually taught in schools and that instead you:

- compete less for individual leadership and learn to co-operate;

- do not count on the ability to complete standard tasks, but develop creative thinking;

- not only solve current problems but also think about future strategies;

- do not rely on pure logic but develop emotional intelligence;

- are no longer afraid of making mistakes and start perceiving life as an experiment;

- perceive the world around you not as a source of capital, but as a living system you belong to.

Unfortunately, it takes a long time to implement major changes in the education system, so for now, you have to work with what you have. You are lucky enough if you go to an advanced school where teachers are creative and teach independent and flexible thinking in the first place. If not, you can better prepare for the future by answering the following questions:

- How can I develop existential skills — passion for learning, awareness, ability to set goals, etc.? How can I include such exercises in my daily routine?

- What kind of life do I want to lead when I become an adult? Which tasks will be most interesting for me to solve? Under what conditions?

- Which industries and professions do I like most in the Atlas?

- Which modern professions are closest to those I have chosen from the Atlas? Where are they taught? Which subjects in my curriculum are critical for these professions?

- What knowledge and skills are needed in these professions now and in the future that the Atlas draws?

- What does the workday and the workplace look like for these professions? Is it possible to work remotely? How long does the workday last? Is it necessary to work in a team? What kind of temperament do most people in this profession have? Where can I find out more about this? Who can I ask?

- What kind of online courses are available in the field that interests me?

- What clubs and offline courses could help me develop the skills I need?

- What generic skills will I need at work? How can I learn them during my studies and in every-day life? (Think outside the box: you can develop systems thinking by playing chess, and you can learn time management by organizing your homework).

It will also be useful to take the "Learning How to learn" course at Coursera.org: https://www.coursera.org/learn/learning-how-to-learn.

AUTHORS

DMITRY SUDAKOV

Head of the project "Atlas of Emerging Jobs", leading expert of the project on the methodology of forecasting demand for the workforce (Skills Technology Foresight, in cooperation with the International Labor Organization), expert of the International Project Research Alliance of the Union "Young Professionals (WorldSkills Russia)", member of the Expert Council of the Agency for Strategic Initiatives.

EVGENY VINOGRADOV

Deputy head of the project "Atlas of Emerging Jobs". Ph.D. in physics and mathematics graduated from Moscow Institute of Physics and Technology. Co-author of 40+ scientific publications in geophysics and earth sciences, with 5 of them listed in Scopus. Certified moderator in Rapid Foresight methodology, Lego Serious Play facilitator, gamificator, and game-designer.

DARIA VARLAMOVA

Editor-in-chief of "Atlas of Emerging Jobs." Graduated from the Department of Journalism at the Higher School of Economics and Screenwriting Department at the Moscow Cinema School. Former editor of the websites "The Big City" and "Theory and Practice." Winner of the "Illuminator-2017" prize in the nomination for natural sciences.

MARIA RAMZAEVA

Editor and author of "Atlas of Emerging Jobs 3.0". Screenwriter, journalist, and writer. Graduated from Moscow State University and the Moscow Cinema School. Author of a fantastic book for teenagers "Inventors" (AST, 2014). Worked on TV series for STS channel, wrote articles in "Republic."

FEDOR KUKIN

Author of "Atlas of Emerging Jobs 3.0". Graduated from the Department of History of Moscow State University and the Moscow Cinema School, a course in Screenwriting. He worked as a book editor, tutor in history and social studies, screenwriter of short films. Currently works as a researcher at the Museum of Contemporary History of Russia.
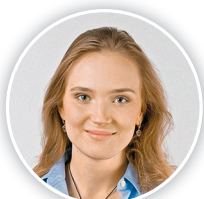
ANNA MIKHAILOVA

Head of Regional Development of "Atlas of Emerging Jobs." Creates an enabling environment for dialogue among various actors: the state, businesses, and communities; designs, moderates, and hosts sessions of various scope, from international events and all-Russian actions to local educational events.

KATERINA DYACHKOVA

Head of the department for the development of generic skills in "Atlas of Emerging Jobs". Psychologist, author, and coach of training for teenagers. Received supplementary education in the areas of catathymic and imaginative therapy and group psychoanalysis.

SUPPORTED BY

- **AGENCY FOR STRATEGIC INITIATIVES**

- **WORLDSKILLS RUSSIA**

- **NTI PLATFORM**

- **CLUBS MOVEMENT**

- **GLOBAL EDUCATION FUTURES**

- **UNIVERSITY 20.35**

- **ALPINA PUBLISHER**

- **EDUCATION SPACES DESIGN STUDIOS**

- **TOCHKA KEEPENIYA (BOILING POINT)**

Special thanks for the contribution to "Atlas of Emerging Jobs" to:
PAVEL AND KATERINA LUKSHA for inventing the first "Atlas of Emerging Jobs".