

# ATLAS OF EMERGING JOBS



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# FOREWORD

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

Isaac Asimov



## ANDREY NIKITIN

General Director, Agency for Strategic Initiatives  
to Promote New Projects

The pace of change around us is much faster than we can imagine. The branch of mechatronics was practically unheard of only two years ago. Today, students and young professionals of high-tech companies are competing in mechatronics at Russian and global vocational skill contests, demonstrating remarkable achievements in this field.

Readers may treat the Atlas of Emerging Jobs in different ways. Some may see it as just a fantasy about what the future professional world may be like. On the other hand, as we all remember, Karel Čapek invented the term "robot" in 1920 and robots are part of our world today. In his *From the Earth to the Moon*, published in 1865, Jules Verne fantasized about lunar modules, sunlight sails and Moon landings. A hundred years have passed and the writer's "foretelling" has come true.

Some may ask in surprise, "You don't really believe it, do you?" Others may even be annoyed at the time being spent on the future with so many unresolved issues in the present.

Yes, we are earnestly thinking about the future. Our confidence in the value of the Atlas is based on the opinions of thousands of renowned practicing experts who spent a significant amount of time picturing the changes that the world will have gone through by 2020 and by 2030 and articulating requirements to be met by competencies and qualifications the day after tomorrow. The experts who we asked to contribute to the project work in the real sector of the economy, as well as government and social institutions, and keep track of the daily changes in demand for staff. There is already demand for people able to replace three or four specialists, or even a whole department. We are sure that progressive parents and youngsters who can feel the rhythm of modern life will read the Atlas carefully, to see behind the illustrations and the simple presentation of important material messages and challenges awaiting them in the near future.

Try showing the Atlas to your children. In it, they may find the future of their dreams.



## ANDREY SHARONOV

Rector, Moscow School of Management  
SKOLKOVO

When asked to describe business school learning briefly, I only say one word: change. The primary skill of a contemporary manager or businessman is the ability to adapt to and drive changes. It forms the substrate for professional knowledge and other skills and competencies. This change-based principle originates from the business environment and is having an impact on the entire education system.

This Atlas of Emerging Jobs is a vision of changes that may happen in the job market in the coming decades, as seen by experts of Moscow School of Management SKOLKOVO and Agency for Strategic Initiatives. It also offers an opportunity to prepare our high school and college students for a world they will enter after obtaining their degrees.

The list of new jobs is a result of a joint effort by several thousand experts, researchers and representatives of leading companies. Rather than an attempt to invent a future, it is the product of an in-depth analysis of trends observed in key industries and companies, driven by a desire to understand how the world is changing and what types of young specialists it will need in the future.

### Using the Atlas

First, try not to think of it as a dogma or a work of science fiction, even though the names of some jobs may evoke a smile. The Atlas offers a good opportunity to ponder what kind of education you and your children need, or what you want to become. Business and market requirements are changing faster than new courses, faculties or certified programs are appearing. Fewer and fewer people manage to pursue a single career throughout their lives.

What's in store for us tomorrow? More likely than not, we will have to change occupation more than once, while constantly learning new ones. The future life of a professional will be more like a sequence of specialties that they will have to master in the process. You may find some of them in the Atlas. We will have to go through dramatic changes quite often and now is the perfect time to prepare.

Undergoing training and obtaining two or three certificates is not enough to be ready for tomorrow. Learning and developing competencies has to be continuous. Before our eyes, education is expanding beyond academic and vocational establishments, which is manifested in the emergence of public online courses, some of them offered by leading world universities. You can set your own academic path through internships, online courses and practice. While this may be much more difficult than the customary *school – institute – postgraduate* education pattern, it is certainly more exciting and effective.

If the Atlas can convince you that your future and your career could turn out far more exciting than you imagined and, most importantly, depend solely on you, then the researchers' efforts have not been wasted.



## GLEB NIKITIN

First Deputy Minister of Industry  
and Trade of the Russian Federation

The Atlas of Emerging Jobs is a unique project that will help us understand which sectors of the economy will obtain new technology and what types of new specialists will be required to apply that technology in the future.

By having a peek beyond the horizon, we can see clearly that occupations emerging in Russian high-tech industries in the coming years will require completely new, cross-sector competencies.

An important general trend is the increasing complexity and integration of activities performed by skilled professionals. The ability to work in several disciplines will become a competitive advantage of a future specialist. Industry will need specialists with interconnected competencies, able to design and adapt new products, conduct marketing campaigns, and organize production processes.

Technical progress will quickly render jobs obsolete, which is yet another challenge and a reason to revise the modern education model, which should take the form of "life-long education".

The Atlas is a kind of beacon for young people mapping their career paths, helping them find a good way to invest their potential. For educational and business institutions, it is a chance to join efforts in developing new training programs and to capture an opportunity to grow proper specialists for the future industry.

Changes are accelerating, the complexity of job tasks is growing, and some specialties that seemed part of science fiction only yesterday will become popular and much needed in the future.

In this context, the Atlas is an attempt to define the types of knowledge, skills and expertise that will become essential for successful professionals in the new world. The Atlas is a map of opportunities on which a person can chart his own path to an exciting future.



## ALEXEY REPIK

President, All Russia Public Organization *Business Russia*  
Member of the Public Chamber of the Russian Federation  
Chairman of the Board of Directors, R-Pharm

In today's quickly-changing world, new technologies emerge much faster than before. To keep pace with new trends, one needs to track changes carefully, as they directly affect the employment structure and competitive performance of key players in industry markets. This is especially important in the pharmaceutical industry, as the scientific progress of past decades has enabled new pharmaceutical products of a new qualitative level to be created at an increasing rate. This and other similar trends are leading to substantial changes in job requirements in the industry, resulting in the emergence of additional key competencies or even new jobs.

Relevant information is gathered and structured in the Atlas of Emerging Jobs, which can be treated as a career guidance tool to help young people choose the right specialty. It is a choice that will determine their success on the job market in the future.

The shortage of human capital is very noticeable at any level, whether regional, industry, or corporate. Meanwhile, it is a key factor in any decision on launching an investment project. Training programs for highly qualified specialists should take into account the needs of the business. In this way, we can form demand for staff based on future challenges.

I would like to stress that the Atlas does not specify definitively what specialists will be in demand on the job market in the coming two decades. In fact, it should be used to identify the main development vectors of industry competencies as competitive performance drivers for businesses. This may help companies formulate more effective human resources management strategies.

# FOREWORD

## WHAT KINDS OF MAPS ARE THERE IN THE ATLAS?

The Atlas is an almanac of promising industries and jobs for the coming 15 to 20 years. It will help you find out which areas will grow intensively, what new technology, products and management practices will emerge, and what new types of specialists employers



### Dmitry Peskov

Director, Young Professionals  
Department, Agency  
for Strategic Initiatives  
to Promote New Projects

The purpose of the Atlas is not academic research. There is no such thing as scientific research of the future. It is simply impossible. Those who claim to have based their predictions on scientific methods are lying because science always involves experiment and hypothesis testing, which cannot exist in forecasting. A forecast can only be tested after the fact.

Our objective is to expose the horizon for parents to choose professions for their children that offer actual prospects and are in demand in the country. This is a self-fulfilling prophecy.

We need to create new industries today. However, the process should not take the form of an overly time-consuming "soft" dialogue between the old schools and the few companies willing to invest. Industries must be created quickly. We would like the Atlas to encourage parents to demand that schools teach new professions, take risks and show the government the ones they need.

will need. The rate of change is growing and the complexity of job tasks is rising. Some popular and highly paid IT jobs, such as a social network manager, professional blogger, search engine optimizer or headhunter, were unknown in the early 2000s. What types of knowledge, skills and expertise should one possess to become a successful specialist in the new world? Our Atlas will help you find answers to these questions, as well as schools providing good basic training.

The Atlas is a field of opportunities in which you can build your own path to an exciting future.

We would like the Atlas to be coherent and useful for readers, and we welcome any comments and proposals which you can send to [atlas@refuture.me](mailto:atlas@refuture.me).

## HOW THE ATLAS WAS MADE

For the first time in Russian history, Moscow School of Management SKOLKOVO and the Agency for Strategic Initiatives have united over 2,500 Russian and global experts in a massive research effort entitled Skill Foresight 2030. The aim of the research has been to identify jobs that are in high demand in 25 industries of the economy. The experts discussed technological changes and socioeconomic processes influencing the structure of practical tasks and built future state maps for industries to identify demand for new competencies and build the images of new jobs.



We have compiled the findings of the research into the Atlas of Emerging Jobs. The current edition features an extended selection of 25 industries, with the scope of research now covering entertainment, media and light industry, as well as other important industrial areas expecting major changes. We believe that the Atlas will develop further, becoming more and more comprehensive.

### FORESIGHT: A WINDOW INTO THE FUTURE?

Foresight is a social technology developed abroad over 30 years ago and used extensively in the spheres of business and government. It enables development forecasting for industries, regions and countries. Forecasts can then be used to agree on courses of action to achieve desired future results.

#### BASIC PRINCIPLES OF FORESIGHT:

- The future depends on our efforts, which means it can be molded.
- The future is variable: it does not arise from the past but depends on the decisions made by participants and stakeholders.
- Some things can be predicted but, on the whole, the future cannot be foretold with complete accuracy. We can either prepare ourselves for a future that we want to see, or prepare that future for ourselves.

It is precisely these principles that the Atlas of Emerging Jobs uses to depict a future which industry leaders plan to create jointly in accordance with their growth strategies, such as adapting to new markets, releasing new products, finding new applications for technology, etc. The Atlas is just one part of preparing for the future we want, as these plans can only be realized if experts appear who are capable of making them a reality.



**Yulia Khanzhina**

Deputy Director, Department of Strategic Development, Ministry of Industry and Trade of the Russian Federation

The development of new industries and traditional sectors is bringing about changes in the image of, and requirements for, jobs and types of specialists. What is driving demand for new highly qualified staff? What are the job requirements at our industrial enterprises? What are the key areas in which the government and businesses should apply their efforts to create conditions necessary to train specialists for the future industry?

While working on the Atlas, we tried to answer these questions and, essentially, defined trends along which to prepare proposals for the education system.

### NAVIGATION THROUGH THE ATLAS

The Atlas of Emerging Jobs consists of two parts:

- the first is dedicated to new jobs.
- the second is dedicated to endangered jobs.

The first part describes jobs that will emerge in the most promising, technologically advanced and fastest-growing industries of the Russian economy in the coming years.

Each industry is covered in a separate chapter beginning with an outlook of the industry (a brief overview of its development until 2030) and a description of new technology and trends that are considered the most promising and compelling by experts and employers in the sector.

Based on the outlook, sample practical challenges that future specialists will face in the industry are listed.

We have made a list of new occupations for each sector with a brief description of relevant job tasks. The list is not final or exhaustive (other jobs and specializations are very likely to appear), but it is illustrative of the important changes about to take place in the industry in the near future.

## JOB CHARACTERISTICS

### PERIODS OF EMERGENCE:



- “Before 2020” means jobs that will be on offer tomorrow. Developed countries already have many of them (e.g. energy auditor, online doctor, GMO farmer, etc.) These trades will be in demand in Russia in the coming decade.



- “After 2020” means jobs that will be on offer the day after tomorrow, subject to the favorable development of technology in Russia and internationally. These specialties may seem chimerical today but the first steps in solving these kinds of job tasks (e.g. those in cyber prosthetics, virtual reality design, etc.) have already been made. These are new jobs in Russia, as well as in foreign countries.

### CROSS-PROFESSIONAL SKILLS

These skills are versatile and important for specialists in all kinds of industries.

Mastering them enables employees to improve the efficiency of their professional activity in their respective industries and allows them to switch industries while staying in demand.

The Atlas also contains a section of recommendations for each industry, explaining:

- **which schools** in Russia provide the basic training required to be among the first specialists of the future;
- **which major employers** operate in the Russian market and the industries in question and are preparing to implement new technology, thereby driving demand for future occupations; and
- **comments on job markets by industry.**

The second part of the Atlas describes the future of certain popular jobs in the next 20 years. Technology is upgraded, equipment becomes obsolete, and tools turn into scrap metal.

Jobs may also become obsolete or extinct. It is a natural process that has accompanied every change in technological cycles, e.g. taxi drivers replaced cab drivers and postmen were replaced by mail server administrators. However, whereas these cycles took decades or centuries to complete in the past, they do not exceed 10 to 15 years now. Although jobs do not “age” instantly, it is better to know which ones are endangered before you get the “retirement slip”.

While trying to choose your future trade, you might be interested in a specialty that will soon become history (e.g. accountant) and be completely unaware of a new and promising sector with new tasks.

# JOBS OF THE FUTURE: WHAT WILL THEY BE LIKE?

Of course, nobody can predict the future fully and accurately. History is full of examples of unsuccessful forecasts and predictions: early in the 20th century, flying enthusiasts promised an airplane for every family; in the mid-20th century, we expected cars powered by nuclear reactors to fill the streets and coffee pots to use nuclear batteries. In the 1970s, many people shared the idea that man would have inhabited Mars and Jupiter's satellites by the beginning of the 21st century. Those unfulfilled predictions aside, there have been many accurate forecasts, e.g. the current technological progress in Japan and South Korea is mainly based on scientific forecasting, while the founders of the famous Silicon Valley not only anticipated the era of personal computers and the Internet, but managed to capitalize on their emergence. Successful predictions are based on understanding exactly what powerful social and technological processes or trends are currently changing the world around us and shaping our future.

So, what trends determine the future of work? What changes are likely to happen?

## GLOBALIZATION

Firstly, the global economy (and Russia as part of the world) will inevitably move toward closer integration and deeper regional specialization. It means that even now we cannot say for sure where this or that complex device has been produced. While a

car or computer may be produced in Japan, its components are supplied from around 30 countries, while 40 other countries provide raw materials. At the same time, even a creative product, such as a cartoon, may be written in the U.S., drawn in Russia, and 3D-animated in China. This is why future employees will have to be able to work in multilingual and multicultural environments, communicating with partners from all over the world. Those partners and employees will be partly located in other countries, which means that the standard will be not just remote employment (where an employee works at home, communicating with colleagues over the Internet), but also work in distributed teams (where specialists working together



**Mohan Reddy**

Department Head, Development and Quality Control of Professional Standards, National Skill Development Corporation (India)

The Atlas seems to have captured everything related to the future. It is a comprehensive paper combining all of the visions for occupational trends in the coming decade.

Of course, we would be interested in taking this to a global scale, where different countries would identify the competencies they would require, based on their national needs.



**Pavel Chernykh**

Technical delegate,  
Worldskills Russia

The idea of the Atlas is brilliant! I have never seen a system tool like this. It includes jobs that are yet to arrive in our country but that are part of today's reality in developed industrial countries. As a Doctor of Philosophy in wood research and processing, I can see the enormous potential of wood applications. As a unique composite material, wood can provide biofuel, food products and various construction materials of the future. A synthetic equivalent has not yet been invented, while nature already offers such forms.

may be on different continents). Apart from speaking a foreign language, one will need the ability to communicate in international professional languages, i.e. to know industry requirements, standards and processes applied. Moreover, a significant number of employees will have to be familiar not only with their respective industries but with the industries of their suppliers and customers, i.e. to speak the language of inter-sector communication, which allows people from the remotest industries to work together (e.g. a psychologist, musician and programmer, co-creating a new sound spa technology for relaxation).

### INCREASING COMPETITION IN THE ECONOMY

Secondly, global economic development is leading to increasingly tougher competition between providers of products and services. The most successful are companies able to create new products and services, and quickly adapt to consumer demand. Competition between them is accompanied by constant changes in the game rules in the market, as new

products emerge to replace existing ones or even to wipe out entire markets (just like automobiles replaced horse-driven carriages and mobile phones replaced pagers).

### ENHANCING CLIENT FOCUS

Strong competition demands an increasingly deeper insight of what the customer actually needs, thereby teaching employees client focus.

### TRANSITION FROM JOB FUNCTIONS TO PROJECT MISSIONS

On the other hand, constant changes in the economy are reducing the number of jobs where one can perform the same duties their entire life (such as an accountant or salesperson), while more and more jobs are appearing in which work is organized as a set of various projects. This is why a crucial skill for most future employees to master will be the ability to work in project teams as well as to engage in project management. Finally, in an age of change, many employees should be prepared to work under high uncertainty, which requires quick decision-making, reacting to changing work conditions, allocating and re-allocating resources, and time-management under conditions of a constantly changing workflow.

### AUTOMATION

One of the most significant changes taking place is the ever-present advancement of automation technologies. It is a well-known fact that the automation of manual and even intellectual labour began quite a while ago. The first machines to replace humans in labour-intensive manual operations were built as early as the XVIII century, and computers began to replace calculating engineers in the mid-XX century. However, the process has intensified considerably over the past

decade, primarily because mass-produced computers have become powerful enough to perform operations, which previously only man could perform (e. g. identifying a criminal in a crowd, recognizing a tumor on a tomogram, or even writing news articles). Another reason is that industrial and household robots are becoming noticeably cheaper. Automation is a requirement of the above-mentioned global competition and takes place when a robot or program is more productive or efficient than a human performing the same task. According to an estimate by Oxford scientists from Martin School's Programme on the Impacts of Future Technology, up to 45% of existing jobs in developed countries will be replaced by robots and computer software within the next 20 years. This does not mean that people will become jobless, however; they will have to find jobs that robots cannot perform. Most of these jobs will be creative. As a result, artistic talents, which have always been a prerogative of solitary creators, will become a mass phenomenon. In addition, more jobs will involve teamwork, with people working less with various mechanisms and more with other people. In these conditions, the ability to organize joint work with other individuals and groups will become an important (and widely common) skill.

## INTENSIVE USE OF PROGRAMMABLE DEVICES

In a world abundant with automatic devices, computers and robots should be our assistants rather than our competitors. Skills will be needed to set up robots and AI systems to perform man-defined tasks. Computer skills, as we understand them today, include using a browser, sending an email, or typing a text in a word processor. These skills will be essential, but far from adequate. In a future world, almost every employee is assumed to have mastered



**Oleg Grinko**

Chairman of the Board of Directors,  
Sberinvest Asset Management  
Company

Right now, we are adopting a new order of life. Life's momentum is faster than the accumulation of statistical data by man. The next five to seven years will bring about substantial changes in all large-scale professional areas. The proliferation of robotics, new materials and mobile devices will lead to significant changes in quality standards and labour efficiency. The boundaries of jobs and competencies are expanding as you read this paper. Even occupations such as plumber or tile layer are beginning to use high technology. Robotics and decision-making support systems are becoming part of the everyday routine but there are no methods or techniques for programming professional success, which would be consistent with the time.

In this context, the Atlas of Emerging Jobs opens a discussion on the matter in simple terms but on a highly qualified level and even manages to solve a number of key issues:

- identifying the reality and pervasive nature of the global changes related to labour and employment;
- introducing clear and comprehensible notions of the changes taking place, perceivable by all professionals and students; and
- providing an opportunity for anyone to convey correctly their own problem of a personal academic path.

at least basic programming skills (indeed, even now, programming is becoming part of standard training for workers in developed industrial countries, as most of them operate programmable CNC machines).

## GROWING COMPLEXITY OF MANAGEMENT SYSTEMS

The professional world of the future is evermore sophisticated, filled with flexible



**Isaac Frumin**

Research Supervisor, Institute of Education, Higher School of Economics

The Atlas is a successful attempt to describe the trends underlying new forms of employment and new jobs. Continuing work on the Atlas and investigating the actual competencies of the population could provide invaluable assistance in developing the human resources of the Russian economy.

technological solutions and enforcing permanent preparedness for change. It will require an increasingly greater number of people able to find their way within it, as well as to efficiently manage projects, teams, or entire organizations. To tackle this problem, more and more employees will need to master systems thinking, an ability to quickly understand the intricacies of complicated processes, organizations or mechanisms. Systems thinking is what helps people quickly come to grips with a problem and develop with a solution, quickly catch up in an unfamiliar business area, and bring their ideas home to people from other industries and branches. Systems thinking is thus one of the key *cross-professional skills* that will be needed by a great number of technical specialists and managers in all industries.

## STRICTER ENVIRONMENTAL REQUIREMENTS

Another very important trend, which has become quite common in the world and the importance of which is being gradually recognized in Russia, is the increase in requirements for the environmental safety of products and services. Environmental safety means not only using clean water and farmed products; to a much greater extent, it means having a frugal attitude to all types of natural resources (e.g. reducing energy, water or raw material consumption) and waste reduction (including recycling, biodegradable materials, etc.). We all realize that natural resources are limited and we are all responsible for the places we inhabit, be it our home, our city, country, or even our shared planet. This is why environmentally conscious behaviour should be made part of standard training for any job, or should even be taught in elementary schools, in order to eventually become a standard for any adult, much like reading and writing skills.

The trends discussed above describe changes to occur concurrently in multiple manufacturing and servicing branches of the economy. These trends require new, cross-professional skills that are key for specialists in any industry. Mastering these skills will enable employees to improve their job performance in their respective industries and to switch industries, all while staying in demand.

## CROSS-PROFESSIONAL SKILLS

Cross-professional skills named by employers as critical for future employees:



Multilingual and multicultural abilities (fluent English and knowledge of a second foreign language, understanding of the national and cultural context of partner countries, and understanding of job specifics in foreign industries).



Programming IT solutions / Managing complex automated systems / Dealing with artificial intelligence.



Ability to work with teams, groups and individuals.



Cross-industry communication skills (understanding of technologies, processes, and market conditions in different related and unrelated sectors).



Systems thinking (ability to define and work with complex systems, including system engineering).



Client focus, ability to address customer requests.



Lean manufacturing, production process management based on permanent focus on removing all types of waste, which implies involving every employee in the business optimization process along with maximum client focus.



Ability to manage projects and processes.



Ability to work under high uncertainty and quickly changing conditions (quick decision-making, prompt reaction to changing work conditions, ability to allocate resources and manage personal time spending).



Environmentally conscious thinking.



Creative abilities, developed aesthetic taste.

# FACTORS THAT DETERMINED THE LIST OF JOBS IN THE ATLAS

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- **Information and computer technology**
- **AUTOMATION**
- **ADVANCED TECHNOLOGIES**

Biotechnology, 3D printing, etc.



## **PROCESS CHANGES IN INDUSTRIES**

- Changing development, production, management and maintenance practices
- Changing workplace
- Changing industry infrastructure



## **MAJOR SOCIAL PROCESSES**

- Globalization
- Rising middle class and changing consumer preferences
- Changing management models in businesses and governments
- Environmental safety of lifestyle and production processes





# CHANGING JOB TASKS OF WORKERS IN INDUSTRIES



## **NEW JOBS...**

emerging due to changing technologies, new work practices, or new consumer needs

## **JOBS CHANGING...**

under influence from ICT and other technologies

## **ENDANGERED JOBS...**

disappearing as a result of automation and other technological and social developments

# HEALTHCARE

- PERSONALIZED HEALTHCARE EXPERT
- HEALTHY OLD AGE CONSULTANT
- MEDICAL INSTITUTION LIFE CYCLE DESIGNER
- ONLINE DOCTOR
- MEDICAL ROBOT OPERATOR
- BIOETHICIST
- GENE THERAPY EXPERT
- MOLECULAR NUTRITION EXPERT
- MEDICAL MARKETING EXPERT
- BIOINFORMATICIAN
- R&D MANAGER IN HEALTHCARE
- GENETIC CONSULTANT
- MEDICAL DATA MANAGER
- MEDICAL EQUIPMENT DESIGNER
- TISSUE ENGINEER
- ROBOTIC PROSTHESIS AND IMPLANT DESIGNER

# BIOTECHNOLOGY

- URBAN ECOLOGIST
- LIVING SYSTEMS DESIGNER
- SYSTEM BIOTECHNOLOGIST
- BIOPHARMACOLOGIST
- PARK ECOLOGIST

# ADVANCED MATERIALS AND NANOTECHNOLOGY

- SMART MATERIAL DESIGNER
- NANOMATERIAL DESIGNER
- SYSTEM ENGINEER OF COMPOSITE MATERIALS
- SAFETY ENGINEER IN NANO INDUSTRY
- GLASS ENGINEER
- RECYCLING TECHNOLOGIST

# AGRICULTURE

- AGRICULTURAL INFORMATICS AND ENGINEERING EXPERT
- GMO FARMER
- CITY FARMER
- AUTOMATED FARMING EQUIPMENT OPERATOR
- AGRICULTURAL ECOLOGIST
- AGRICULTURAL ECONOMIST

# SECURITY

- INTEGRATED INDUSTRIAL SECURITY AUDITOR
- REMOTE SECURITY COORDINATOR
- ERGONOMIC DESIGNER OF WEARABLE SECURITY DEVICES
- EXPERT FOR MITIGATING SYSTEMIC ENVIRONMENTAL DISASTERS
- PERSONAL SECURITY DESIGNER
- BUSINESS CONTINUITY MANAGER

# ROAD TRANSPORT

- AUTOMATED TRANSPORTATION SYSTEM OPERATOR
- CROSS-LOGISTICS OPERATOR
- INTERMODAL TRANSPORT TECHNICIAN
- SMART MANAGEMENT SYSTEM ARCHITECT
- INTERMODAL HUB DESIGNER
- TRANSPORTATION NETWORK SAFETY ENGINEER
- DESIGNER OF COMPOSITE STRUCTURES FOR VEHICLES
- HIGH-SPEED RAILWAY DESIGNER
- SMART ROAD BUILDER

# WATER TRANSPORT

- PORT ECOLOGIST
- ARCTIC NAVIGATION SPECIALIST
- NAVAL INFRASTRUCTURE SYSTEM ENGINEER

# AVIATION

- AIRCRAFT RECYCLING TECHNOLOGIST
- AIRSHIP INFRASTRUCTURE DESIGNER
- SMALL AIRCRAFT PRODUCTION ENGINEER
- DYNAMIC CONTROL SMART MANAGEMENT SYSTEM DESIGNER
- AIRSHIP DESIGNER
- OPERATING DATA ANALYST
- UNMANNED FLIGHT INTERFACE DESIGNER

# SPACE

- SPACE STRUCTURE LIFE CYCLE DESIGNER
- SPACE ROAD ENGINEER
- SPACE BIOLOGIST
- SPACE TRAVEL MANAGER
- SPACE GEOLOGIST
- LIFE SUPPORT SYSTEM ENGINEER

# IT SECTOR

- ONLINE LAWYER
- BIG DATA MODEL DESIGNER
- DIGITAL LINGUIST
- INTERFACE DESIGNER
- IT PREACHER
- INFORMATION SYSTEMS ARCHITECT
- NEURAL INTERFACE DESIGNER
- IT AUDITOR
- INFORMATION SECURITY SUPERVISOR
- PERSONAL PROFILE SECURITY ADVISOR
- SMART ENVIRONMENT CYBER TECHNICIAN
- CYBER DETECTIVE

# MINING AND PROCESSING OF MINERAL RESOURCES

- MINING SYSTEM ENGINEER
- ROBOTIC SYSTEM ENGINEER
- ENVIRONMENTAL ANALYST IN MINING INDUSTRIES
- UNMANNED EXPLORATION AIRCRAFT OPERATOR
- DISTRIBUTED MINING TEAM COORDINATOR
- TELEMETRY DATA INTERPRETATION ENGINEER

# CONSTRUCTION

- CONSTRUCTION TECHNOLOGY UPGRADE SPECIALIST
- FOREMAN WATCHER
- 3D PRINTING DESIGNER IN CONSTRUCTION
- SPECIALIST IN OLD STRUCTURE RENOVATION/REINFORCEMENT
- ZERO ENERGY HOUSE ARCHITECT
- SMART HOUSE INFRASTRUCTURE DESIGNER
- BIM MANAGER DESIGNER
- ACCESSIBLE ENVIRONMENT DESIGNER
- ENVIRONMENTAL ANALYST IN CONSTRUCTION

# CHILDREN'S PRODUCTS AND SERVICES

- CHILDREN'S FUTURE IMAGE EXPERT
- CHILDREN'S R&D MANAGER
- CHILDREN'S PSYCHOLOGICAL SECURITY SPECIALIST
- TRANSMEDIA PRODUCT DESIGNER

## ROBOTICS AND MECHANICAL ENGINEERING

- INDUSTRIAL ROBOT DESIGNER
- DESIGNER OF NEURAL INTERFACES FOR ROBOT CONTROL
- MEDICAL ROBOT DESIGNER
- COMPOSITE ENGINEER
- ERGONOMIC DESIGNER
- HOUSEHOLD ROBOT DESIGNER
- CHILDREN'S ROBOT DESIGNER
- MULTI-PURPOSE ROBOTIC SYSTEMS DESIGNER

## LIGHT INDUSTRY

- CLOTHES 3D MODEL PROGRAMMER
- IT INTERFACE DESIGNER FOR LIGHT INDUSTRY
- TECHNO-STYLIST
- ADVANCED FABRICS DESIGNER
- HEALTHY CLOTHES EXPERT
- CLOTHES RECYCLING SPECIALIST

## METALLURGY

- ADVANCED METALS ENGINEER
- EQUIPMENT DESIGNER IN POWDER METALLURGY
- EQUIPMENT SUPERVISOR
- ECORECYCLER IN METALLURGY

## POWER GRIDS AND POWER MANAGEMENT

- ELECTRIC VEHICLE CHARGING STATION OPERATOR
- POWER CONSUMPTION SYSTEM DESIGNER
- ELECTRICITY CONSUMER RIGHTS EXPERT
- POWER GRID ADJUSTER/CONTROLLER IN DISTRIBUTED GENERATION
- ENERGY AUDITOR
- SYSTEM ENGINEER FOR SMART POWER GRIDS
- POWER MARKETING EXPERT

## ENERGY GENERATION AND STORAGE

- WEATHER EXPERT IN POWER INDUSTRY
- LOCAL POWER SUPPLY SYSTEM SPECIALIST
- RECUPERATION SYSTEM DESIGNER
- POWER GENERATION SYSTEM UPGRADE MANAGER
- WEARABLE POWER DEVICE DESIGNER
- MICRO GENERATION SYSTEM DESIGNER
- ENERGY STORAGE DEVICE DESIGNER

## ART AND CULTURE

- COLLECTIVE ART SUPERVISOR
- CREATIVE STATE TRAINER
- PERSONAL AESTHETIC DEVELOPMENT TUTOR
- ART APPRAISER
- SCIENCE ARTIST

## MEDIA AND ENTERTAINMENT

- CONTENT AGGREGATOR EDITOR
- INFO STYLIST
- SEMANTIC FIELD PRODUCER
- MEDIA SOFTWARE DESIGNER
- MEDIA POLICEMAN
- VIRTUAL REALITY ARCHITECT
- VIRTUAL WORLD DESIGNER
- GAME PRACTITIONER
- EMOTION DESIGNER

## TOURISM AND HOSPITALITY

- INDIVIDUAL TOUR DIRECTOR
- SPACE BRAND MANAGER
- AUGMENTED REALITY AREA DESIGNER
- ROBOT ATTENDANT
- TERRITORY ARCHITECT
- SMART TRAVEL SYSTEM DESIGNER
- TOUR NAVIGATOR DESIGNER

## EDUCATION

- MODERATOR
- ACADEMIC PATH DESIGNER
- MIND FITNESS COACH
- TUTOR
- PROJECT TRAINING ORGANIZER
- GAME MASTER
- STARTUP MENTOR
- EDUCATIONAL ONLINE PLATFORM COORDINATOR
- GAME EDUCATOR
- DESIGNER OF CONSCIOUSNESS TRAINING TOOLS
- ECOPREACHER

## SOCIAL SECTOR

- PERSONAL CHARITY PLATFORM MODERATOR
- SOCIAL CONFLICT MEDIATOR
- GOVERNMENT AUTHORITY COMMUNICATION PLATFORM MODERATOR
- SOCIAL WORKER FOR DISABLED PERSONS ADAPTATION USING INTERNET TECHNOLOGY
- MIGRANT ADAPTATION SPECIALIST
- CROWD SOURCING EXPERT FOR SOCIAL ISSUES
- STATE-PRIVATE PARTNERSHIP SPECIALIST FOR THE SOCIAL SECTOR
- ENVIRONMENT COUNSELOR

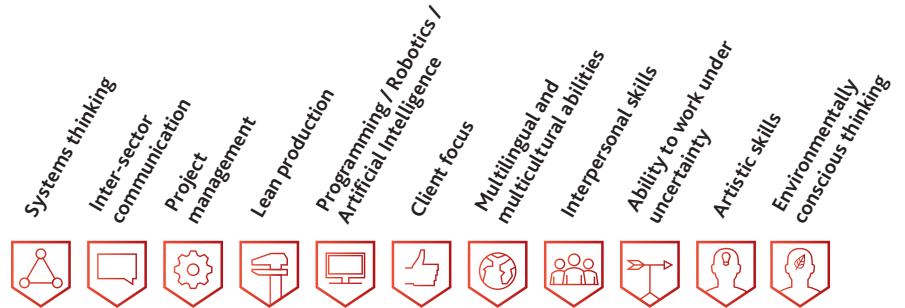
## MANAGEMENT

- TIME BROKER
- TREND WATCHER / FORESIGHTER
- CROSS-CULTURAL COMMUNICATION MANAGER
- ONLINE SALES MANAGER
- PRODUCTION COORDINATOR IN DISTRIBUTED COMMUNITIES
- CORPORATE VENTURE FUND PORTFOLIO MANAGER
- CORPORATE ANTHROPOLOGIST
- ENVIRONMENT AUDITOR
- INDIVIDUAL FINANCIAL TRAJECTORY DESIGNER
- VIRTUAL LAWYER
- COMMUNITY DEVELOPMENT PLAN COORDINATOR
- PERSONAL BRAND MANAGER
- USER COMMUNITY MODERATOR
- TIME MANAGER

## FINANCIAL SECTOR

- INTELLECTUAL PROPERTY APPRAISER
- DIRECT TALENT INVESTMENT FUND MANAGER
- PERSONAL PENSION PLAN DESIGNER
- MULTICURRENCY TRANSLATOR
- CROWD FUNDING AND CROWD INVESTING PLATFORM MANAGER

# CROSS-PROFESSIONAL SKILLS IN FUTURE JOBS

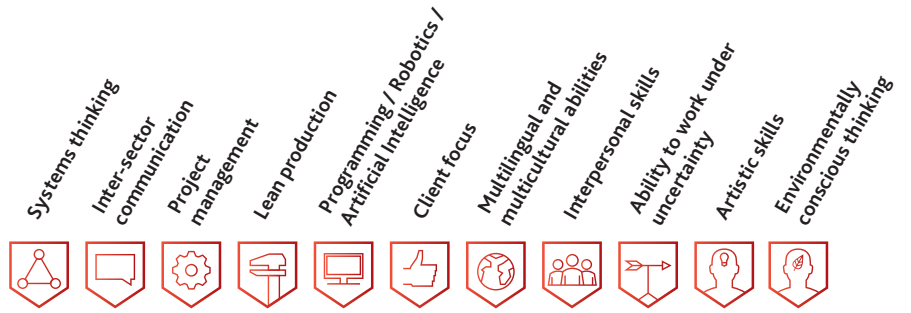


## BIOTECHNOLOGY

	Systems thinking	Inter-sector communication	Project management	Lean production	Programming / Robotics / Artificial Intelligence	Client focus	Multilingual and multicultural abilities	Interpersonal skills	Ability to work under uncertainty	Artistic skills	Environmentally conscious thinking
System biotechnologist	✓	✓	✓	✓		✓	✓				✓
Living system architect	✓	✓	✓	✓	✓	✓	✓				✓
Urban ecologist	✓	✓		✓	✓		✓	✓			✓
Park ecologist	✓	✓	✓			✓	✓				✓
Biopharmacologist	✓	✓	✓		✓		✓				

## HEALTHCARE

	Systems thinking	Inter-sector communication	Project management	Lean production	Programming / Robotics / Artificial Intelligence	Client focus	Multilingual and multicultural abilities	Interpersonal skills	Ability to work under uncertainty	Artistic skills	Environmentally conscious thinking
Medical data manager	✓		✓		✓		✓				
Medical equipment designer	✓	✓	✓		✓	✓	✓				✓
Bioethicist	✓				✓	✓		✓	✓		
Genetic consultant	✓				✓	✓					
Bioinformatician	✓				✓		✓		✓		
Medical marketing expert	✓	✓				✓	✓	✓			
R&D manager in healthcare	✓	✓	✓			✓	✓				
Molecular nutrition expert	✓					✓					✓
Medical robot operator	✓				✓		✓				
Gene therapy expert	✓				✓		✓				
Robotic prosthesis and implant designer	✓	✓	✓	✓	✓		✓				✓
Tissue engineer	✓	✓	✓		✓						
Medical institution life cycle designer	✓		✓	✓		✓		✓			
Personalized healthcare expert	✓				✓	✓	✓	✓			
Healthy old age consultant	✓		✓			✓	✓	✓		✓	
Online doctor	✓				✓	✓	✓	✓			



## AGRICULTURE

Agricultural informatics and engineering expert	✓	✓	✓		✓						✓
GMO farmer	✓	✓	✓	✓	✓	✓	✓				
City farmer	✓	✓	✓			✓	✓				✓
Automated farming equipment operator				✓	✓						✓
Agricultural ecologist	✓	✓									✓
Agricultural economist	✓		✓		✓				✓		✓

## ENERGY GENERATION AND STORAGE

Power generation system upgrade manager	✓	✓	✓	✓			✓				✓
Micro generation system designer	✓	✓	✓	✓	✓	✓	✓				
Weather expert in power industry	✓	✓			✓						
Recuperation system designer	✓	✓	✓	✓	✓						✓
Local power supply system specialist	✓	✓	✓	✓	✓						✓
Wearable power device designer	✓	✓	✓		✓	✓	✓	✓		✓	
Energy storage device designer	✓		✓	✓	✓						✓

## POWER GRIDS AND POWER MANAGEMENT

Power marketing expert	✓	✓				✓	✓	✓			
Electricity consumer rights expert	✓					✓	✓	✓	✓		
Energy auditor	✓			✓		✓					✓
Power consumption system designer	✓		✓	✓		✓					✓
System engineer for smart power grids	✓	✓	✓	✓	✓		✓				✓
Electric vehicle charging station operator				✓		✓					
Power grid adjuster/controller in distributed generation	✓			✓	✓						✓



### ROAD TRANSPORT

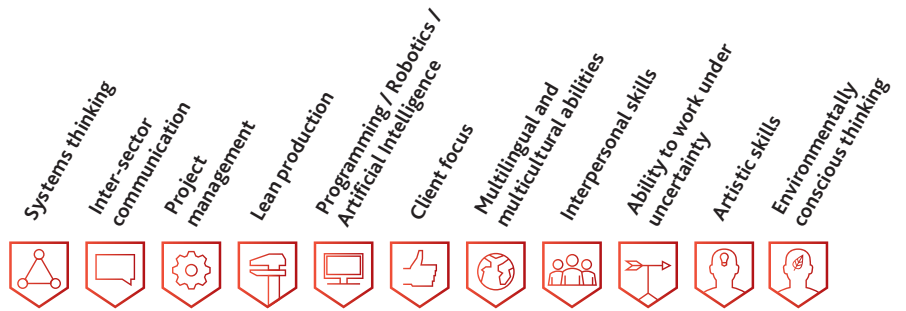
	Systems thinking	Inter-sector communication	Project management	Lean production	Programming / Robotics / Artificial Intelligence	Client focus	Multilingual and multicultural abilities	Interpersonal skills	Ability to work under uncertainty	Artistic skills	Environmentally conscious thinking
Automated transportation system operator	✓			✓	✓				✓		
Transportation network safety engineer	✓	✓	✓		✓		✓	✓	✓		✓
Cross-logistics operator	✓		✓	✓		✓	✓	✓	✓		
Intermodal hub designer	✓	✓	✓	✓	✓		✓				✓
Intermodal transport technician				✓		✓	✓		✓		
Smart road builder			✓	✓	✓						✓
Designer of composite structures for vehicles	✓	✓	✓	✓	✓						✓
High-speed railway designer	✓	✓	✓	✓	✓						✓
Smart management system architect	✓	✓	✓	✓	✓						

### WATER TRANSPORT

Port ecologist	✓	✓			✓		✓				✓
Marine infrastructure system engineer	✓	✓	✓		✓						✓
Arctic navigation specialist	✓		✓				✓		✓		

### AVIATION

Unmanned flight interface designer	✓		✓		✓	✓	✓				
Small aircraft production engineer	✓		✓	✓	✓	✓					✓
Operating data analyst	✓				✓						
Aircraft recycling technologist	✓	✓	✓	✓							✓
Airship designer	✓	✓	✓	✓	✓						
Airship infrastructure designer	✓	✓	✓	✓	✓		✓				✓
Dynamic control smart management system designer	✓		✓		✓						



**SPACE**

Space structure designer	✓	✓	✓	✓	✓		✓				✓
Space travel manager			✓			✓	✓	✓			
Life support system engineer	✓			✓	✓		✓				
Space road engineer	✓				✓		✓		✓		✓
Space biologist	✓	✓	✓		✓		✓				
Space geologist	✓		✓	✓	✓		✓		✓		

**ADVANCED MATERIALS AND NANOECHNOLOGY**

Glass engineer	✓		✓	✓							
Recycling technologist	✓	✓	✓	✓	✓						✓
System engineer of composite materials	✓	✓	✓			✓	✓				✓
Nanomaterial designer	✓		✓		✓		✓				
Smart environment designer	✓	✓	✓		✓	✓	✓			✓	
Safety engineer in nano industry	✓	✓			✓		✓		✓		✓

**IT SECTOR**

Information systems architect	✓	✓	✓		✓	✓					
Interface designer	✓	✓			✓			✓			
Online lawyer	✓					✓	✓				
Neural interface designer	✓	✓	✓		✓		✓				
IT preacher			✓		✓	✓	✓	✓			
Digital linguist	✓	✓			✓	✓	✓				
Big Data model designer	✓	✓	✓		✓	✓					
IT auditor	✓				✓	✓		✓	✓		
Information security supervisor	✓		✓		✓				✓		
Personal profile security advisor	✓				✓	✓		✓			
Smart environment cyber technician	✓				✓				✓		
Cyber detective	✓				✓			✓	✓		



### MINING AND PROCESSING OF MINERAL RESOURCES

	Systems thinking	Inter-sector communication	Project management	Lean production	Programming / Robotics / Artificial Intelligence	Client focus	Multilingual and multicultural abilities	Interpersonal skills	Ability to work under uncertainty	Artistic skills	Environmentally conscious thinking
Mining system engineer	✓	✓	✓	✓							✓
Environmental analyst in mining industries	✓	✓	✓		✓				✓		✓
Robotic system engineer	✓	✓			✓						✓
Unmanned exploration aircraft operator					✓				✓		✓
Distributed mining team coordinator	✓		✓	✓			✓				
Telemetric data interpretation engineer	✓								✓		

### CONSTRUCTION

	Systems thinking	Inter-sector communication	Project management	Lean production	Programming / Robotics / Artificial Intelligence	Client focus	Multilingual and multicultural abilities	Interpersonal skills	Ability to work under uncertainty	Artistic skills	Environmentally conscious thinking
Specialist in old structure renovation/reinforcement	✓	✓	✓	✓	✓				✓		✓
Zero energy house architect	✓	✓	✓	✓		✓				✓	✓
Construction technology upgrade specialist	✓	✓	✓	✓							✓
Smart house infrastructure designer	✓	✓	✓		✓	✓					
Foreman watcher	✓	✓	✓	✓	✓		✓				
3D printing designer in construction	✓	✓	✓	✓	✓	✓					✓
BIM manager designer	✓	✓	✓	✓	✓						✓
Accessible environment designer				✓		✓	✓		✓		
Environmental analyst in construction	✓	✓				✓					✓

### ROBOTICS AND MECHANICAL ENGINEERING

	Systems thinking	Inter-sector communication	Project management	Lean production	Programming / Robotics / Artificial Intelligence	Client focus	Multilingual and multicultural abilities	Interpersonal skills	Ability to work under uncertainty	Artistic skills	Environmentally conscious thinking
Multi-purpose robotic systems designer	✓				✓				✓		✓
Ergonomic designer	✓	✓	✓		✓		✓				
Composite engineer	✓	✓			✓						
Household robot designer	✓	✓	✓		✓	✓					
Industrial robot designer	✓	✓	✓	✓	✓						✓



Systems thinking  
Inter-sector communication  
Project management  
Lean production  
Programming / Robotics / Artificial Intelligence  
Client focus  
Multilingual and multicultural abilities  
Interpersonal skills  
Ability to work under uncertainty  
Artistic skills  
Environmentally conscious thinking

Children's robot designer	✓	✓	✓		✓	✓		✓		✓	
Designer of neural interfaces for robot control	✓		✓		✓			✓			
Medical robot designer	✓	✓	✓		✓						

FINANCIAL SECTOR

Intellectual property appraiser	✓	✓	✓		✓		✓				
Personal pension plan designer	✓		✓			✓					
Multicurrency translator	✓				✓	✓	✓				
Crowd funding and crowd investing platform manager	✓		✓			✓	✓	✓			
Direct talent investment fund manager	✓		✓			✓	✓	✓			

MANAGEMENT

Time broker		✓				✓	✓	✓			
Time manager	✓					✓	✓	✓			
Production coordinator in distributed communities	✓	✓	✓	✓		✓	✓	✓			
Environment auditor	✓	✓	✓					✓			✓
Trend watcher / foresighter	✓	✓	✓			✓	✓				
Virtual lawyer						✓	✓	✓			
Corporate venture fund portfolio manager	✓	✓	✓				✓	✓			
Corporate anthropologist	✓					✓	✓	✓			
Community development plan coordinator	✓	✓	✓				✓	✓		✓	
Personal brand manager						✓	✓	✓		✓	
Cross-cultural communication manager	✓	✓				✓	✓	✓			
User community moderator	✓		✓		✓	✓	✓	✓			
Online sales manager	✓		✓		✓	✓		✓			
Individual financial trajectory designer	✓		✓			✓	✓	✓			

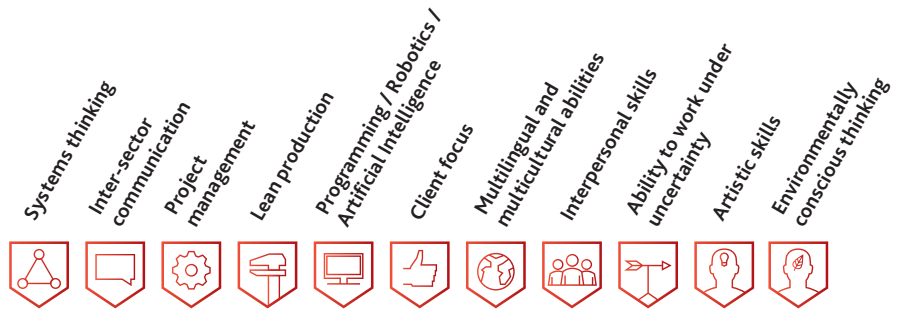


## SOCIAL SECTOR

	Systems thinking	Inter-sector communication	Project management	Lean production	Programming / Robotics / Artificial Intelligence	Client focus	Multilingual and multicultural abilities	Interpersonal skills	Ability to work under uncertainty	Artistic skills	Environmentally conscious thinking
Crowd sourcing expert for social issues			✓		✓	✓	✓	✓			
Government authority communication platform moderator			✓				✓	✓			
Social conflict mediator	✓						✓	✓	✓		
Environmental counselor	✓		✓				✓	✓			✓
Personal charity platform moderator			✓		✓	✓	✓	✓			
State-private partnership specialist for the social sector	✓	✓	✓			✓	✓	✓			
Social worker for disabled persons adaptation using internet technology			✓		✓	✓		✓			
Migrant adaptation specialist					✓		✓	✓			

## EDUCATION

	Systems thinking	Inter-sector communication	Project management	Lean production	Programming / Robotics / Artificial Intelligence	Client focus	Multilingual and multicultural abilities	Interpersonal skills	Ability to work under uncertainty	Artistic skills	Environmentally conscious thinking
Moderator	✓	✓	✓					✓		✓	
Academic path designer	✓	✓	✓		✓	✓		✓		✓	
Tutor	✓	✓	✓			✓		✓			
Project training organizer	✓	✓	✓			✓		✓		✓	
Educational online platform coordinator	✓	✓	✓		✓		✓	✓			
Startup mentor	✓	✓	✓		✓	✓	✓				
Ecopreacher	✓	✓	✓					✓			✓
Game master	✓	✓					✓	✓		✓	
Game educator	✓	✓					✓	✓		✓	
Mind fitness coach	✓	✓	✓		✓	✓		✓			
Designer of consciousness training tools	✓	✓	✓		✓	✓		✓			



### CHILDREN'S PRODUCTS AND SERVICES

Transmedia product designer	✓	✓	✓			✓	✓	✓		✓	
Children's R&D manager	✓	✓	✓			✓		✓		✓	
Children's future image expert	✓		✓			✓	✓	✓			
Children's psychological security specialist	✓	✓	✓			✓	✓	✓			

### METALLURGY

Advanced metals engineer	✓		✓		✓						
Equipment designer in powder metallurgy	✓	✓	✓	✓	✓						✓
Equipment supervisor	✓			✓	✓						✓
Ecorecycler in metallurgy	✓	✓								✓	✓

### LIGHT INDUSTRY

Clothes 3D model programmer		✓		✓	✓					✓	
IT interface designer for light industry		✓	✓		✓						
Techno-stylist		✓			✓	✓				✓	✓
Advanced fabrics designer	✓	✓			✓					✓	✓
Healthy clothes expert						✓		✓			✓
Clothes recycling specialist	✓			✓							✓

### ART AND CULTURE

Collective art supervisor		✓	✓				✓	✓		✓	
Creative state trainer						✓		✓	✓	✓	
Personal aesthetic development tutor	✓	✓				✓	✓	✓			
Science artist		✓	✓				✓			✓	
Art appraiser	✓					✓	✓	✓		✓	



**MEDIA AND ENTERTAINMENT**

Content aggregator editor			✓		✓	✓	✓	✓			
Info stylist					✓	✓	✓	✓			
Semantic field producer	✓				✓	✓	✓	✓	✓		
Media software designer	✓	✓			✓	✓		✓			
Media policeman								✓	✓		
Virtual reality architect	✓	✓	✓		✓	✓					
Virtual world designer	✓				✓	✓	✓			✓	✓
Game practitioner						✓	✓	✓		✓	
Emotion designer	✓	✓				✓		✓		✓	

**TOURISM AND HOSPITALITY**

Individual tour director						✓	✓	✓		✓	
Space brand manager	✓		✓			✓	✓	✓		✓	
Augmented reality area designer					✓	✓	✓			✓	
Robot attendant			✓		✓	✓	✓				
Territory architect		✓			✓	✓	✓	✓		✓	
Smart travel system designer			✓		✓	✓					
Tour navigator designer					✓	✓	✓				

**SECURITY**

Integrated industrial security auditor	✓				✓			✓	✓		
Remote security coordinator	✓				✓				✓		
Ergonomic designer of wearable security devices			✓		✓	✓				✓	
Expert for mitigating systemic environmental disasters	✓	✓	✓		✓			✓	✓		✓
Personal security designer	✓				✓	✓		✓	✓		
Business continuity manager	✓		✓		✓				✓		

Part I

# FUTURE JOBS

“It is a remarkable feeling to know that you are  
building the world yourself”

Isaac Asimov



# BIOTECHNOLOGY

Until not long ago, the biotechnology industry had been underdeveloped in Russia, which had fallen far behind most developed industrial countries. The industry is, however, a most promising one — during the coming decades, it will develop itself and have a strong influence on other branches, such as healthcare, power engineering, basic materials, urban and rural economy. Biotechnology provides living systems to solve the various problems of humankind.

Commitment to a maximum possible level of environmental safety, development of genetic engineering, and the possibility of simulating many natural processes on a computer have brought modern science to the verge of very promising discoveries: new energy sources and organic electronics, biodegradable materials and gene reprogramming. Biotechnology often helps to find new solutions across industries, e.g. when power engineers and microbiologists are working on a biofuel together.

## WHAT IS IT LEADING TO?

- Organic materials (including new fabrics, construction materials, pharmaceutical drugs, biocompatible devices) will replace inorganic fabrics and materials.
- Alternative bioenergy and biofuels will be developed intensively, along with solar and wind power applications.
- Emerging agricultural technologies will help to defeat hunger all across the globe. Genetically modified organisms will provide solutions for a host of problems: they provide greater yield, are resilient to diseases, and allow less use of pesticides and fertilizers. Vertical farming will save space and enable the highest farm yield possible, even with modest plot sizes.
- Cities will strive for sustainability and zero waste, where grain crops and microbiological cultures grown within city limits would satisfy all the food and energy needs of the population, with waste recycled into new organic resources. Copenhagen and Barcelona are already moving in this direction, and the United Arab Emirates are building the sustainable Masdar City.
- Chemical drugs and household chemicals will be abandoned in favor of biosynthetic compounds. For example, modern medical science offers a mild alternative to antibiotics, i.e. bacteriophages (viruses that selectively infect germs, without harming the body)

### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



Lean production



Artistic skills



Environmental thinking

## POSSIBLE FUTURE CHALLENGES

- Design and production of products with programmable properties, in particular:
  - Development of biodegradable materials to solve rejection issues in precision surgery, traumatic surgery and transplantology
  - Development of compounds for restoring natural balance in the environment
- Forecasting and monitoring of potential changes in the biosphere caused by emerging biotechnological products
- Development of compounds and devices for preventive diagnosis
- Production of clean chemicals and compounds
- Biosynthesis of edible products and substances for famine-ridden regions and countries
- Elaboration of product life cycles, from raw material preparation to disposal and decomposition, for the purpose of resource saving and waste disposal.
- Production of advanced materials and products through the development of bio-cultivation competencies.
- Development of biocompatible electronic devices, detachable as well as implanted
- Development of transgenic micro- and macro-organisms, e.g. genetic modification of plants for biomass production





## SYSTEM BIOTECHNOLOGIST

Specialist in replacing obsolete solutions in various branches with biotechnology products. They will provide assistance to transportation companies transitioning from diesel fuel to biofuel and to construction companies switching from cement and concrete to biomaterials.

job  
to emerge  
before 2020

to  
20 y.

CROSS-PROFESSIONAL SKILLS



## BIOPHARMACOLOGIST

Specialist in designing custom biocompounds and replacing synthetic compounds with biocompounds. A number of important medicines, e.g. penicillin and insulin, are already produced using genetically modified bacteria.

job  
to emerge  
before 2020

to  
20 y.

CROSS-PROFESSIONAL SKILLS



## URBAN ECOLOGIST

Designer of new cities based on environmentally-friendly biotechnologies, specializing in construction, power engineering and environment pollution control. The job is already on offer, with high-tech green cities being designed and constructed in Malaysia, China, the United Arab Emirates, India, South Korea, and European countries.

job  
to emerge  
before 2020

to  
20 y.

CROSS-PROFESSIONAL SKILLS





# PARK ECOLOGIST

Professional in charge of monitoring and analyzing the environmental condition of public spaces (parks, boulevards, squares, alleys, etc.), development and implementation of solutions for landscaping, populating territories with animals and insects, and other measures to maintain environmental balance in urban green areas. For example, Royal Parks, a London-based company in charge of eight city parks, employs its own staff of environmental specialists responsible for 418 rare species of plants, animals and mushrooms. On the other hand, the specialty may be regarded as a new version of the long-existing trade of urban ecologist, which appeared as early as in the 1970s.



## SOCIAL DIARY

### 16/07 THE CLEANEST PARK IN TOWN!

Research results arrived: Our park was recognized as the cleanest park of the city in 2018.

Thanks to all those who contributed!

### 18/07 RECHARGEABLE BENCHES

The new garden benches have finally arrived from eco-designer Steven Ma. They accumulate solar energy to power street lights at night. Looks very futuristic, too!

### 19/07 RARE BIRDS IN OUR PARK

We have three new rare bird species: long-tailed tit, kestrel and black woodpecker. For this occasion, all are invited to a lecture on ornithology at our environmental center on Saturday.

### 20/07 APPLE TREES IN BLOOM

Our apples and roses have broken all blossoming records this year. Thanks to a system of separate waste collection and your conscience, we have recycled all food waste into fertilizers. The result is self-evident :)



## CROSS-PROFESSIONAL SKILLS





# LIVING SYSTEMS DESIGNER

Specialist in planning, designing and creating closed-cycle technologies involving genetically modified organisms and microorganisms. This type of professional will be irreplaceable in sustainable cities, as they will be able to calculate the required capacity of bioreactors, design urban farms, and elaborate waste recycling systems.

## SOCIAL DIARY

### 12/01 **IN SHEREMETYEVO**

Flying to a festival to mark the grand opening of Masdar City, a sustainable city in the Rub Al-Khali desert. The city took 20 years to be built, but is now finally complete. In a way, it is my project too – I made a contribution as well, as an advisor on membrane bioreactors.

### 13/01 **MASDAR CITY**

What a delight it is to change into light clothes! It's 24°C here. The peculiar architecture exposes little of the sky to look at, but the city has been planned so that streets are always in the shade allowing long walks, even at noontime. Personally, I prefer to ride in CyberCab robotic capsules.

### 15/01

The stars of the festival are the cyborg drummer Jason Barnes and a robot orchestra. The eco-transport parade is being held tomorrow. They say it is going to be amazing, like the race in Star Wars.

### 16/01

Talked to guys from MIT, who left to work for the Masdar Institute of Science and Technology. Agreed on a joint project in urban recycling technologies.



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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Almost every region has a national university to train specialists in biotechnology and agricultural technologies. Below is a list of universities providing the most comprehensive knowledge, skills and expertise that form the necessary foundation of future jobs.

- Science and Education Center for Pharmaceutics and Biotechnology at Tomsk Polytechnic University
- Moscow State University (faculties of biology, soil science, bioengineering and bioinformatics)
- Saint Petersburg State University (biology and soil faculty)
- Northern (Arctic) Federal University (faculty of biotechnology)
- Udmurt State University (faculty of medical biotechnology)
- Far East State Technical Fisheries University (water bioresources and aquaculture, biotechnology, food production from vegetative and animal hydro-materials)
- Russian State Agrarian University – K. A. Timiryazev Moscow Agricultural Academy (specialties are: biotech farmer, breeder, genetic engineer)

## BIOTECHNOLOGY EMPLOYERS IN THE RUSSIAN FEDERATION

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- R-PHARM
- Nanolek
- NEARMEDIC Plus
- BIOCHEMMASH
- Baikal Nordic
- Biotechnology Corporation
- Alkor Bio
- Sibbiopharm
- International Biotechnology Center Generium
- Northern BioPharmCluster at MIPT
- Biotechnological Cluster Pushchino
- Altai Biopharmaceutical Cluster

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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The Russian biotechnology sector is still in its development stage, practically lacking major players, represented by a great number of small and medium private companies engaged in specific applications of biotechnological solutions in various industries, such as in healthcare and pharmaceuticals, bioenergy, agro-industrial complex, veterinary, and wood processing industries (e.g. growing transgenic forests).



# HEALTHCARE

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## HOW IS THE INDUSTRY CHANGING?

Healthcare has always been a vital part of human life, and its significance will only continue to grow in the future; even today we can see life expectancy growing, which means increasing attention to human health, from inception and throughout the entire life, while the attention of medical science is shifting toward age-related diseases and health support.

DNA research has launched a new era in medical science, with doctors switching from diagnosing and treating diseases of separate organs and tissues to a holistic approach to human health. As gene analysis becomes an affordable service, every patient will soon have their own “natural medical record” (his own genetic code, decoded by specialists) that they will show to their doctor at a consultation. First of all, this approach provides a boost for the development of preventive healthcare, which aims to identify and prevent potential diseases at early stages. In addition, mass treatment methods are giving way to individual therapy at the genome level. Moreover, biotechnology is already broadly applied in healthcare, such as in the development of medicines and growing of transplantable organs and tissues. Robotics is also making a contribution, as automatic devices boast better precision than human surgeons, while carefully designed robotic prostheses, apart from compensating for disabilities, may open new horizons for people.

Future medical science will enable highly accurate diagnoses throughout the life of a person and an opportunity for people to predict diseases that may affect them

and their children in the future. Another benefit will be the ability to study in detail the genetic characteristics of an embryo and alter some of them to prevent lethal hereditary diseases.

Computers will be used to simulate personal development scenarios of a disease, to work out a treatment method suitable for a particular case. Special robots will perform surgeries with minimal damage to tissues in order to reduce the risk of infection and avoid post-surgery scars. Robotic prostheses for limbs and certain organs will become highly sophisticated as well as affordable. Special “replaceable parts” will appear for different activities. For example, there is already the Cheetah running prosthesis, while American drummer Jason Barnes, who lost his right hand, has an artificial hand, with which he is able to play complex drum solos.

Network-enabled microdiagnostic devices will immediately alert a doctor about any significant changes in the condition of a patient. The same devices will enable patients to receive advice from any specialist through cloud bases. Biological feedback systems are gaining popularity, such as fitness trackers that analyze the user’s physical activity and quality of sleep, or neurogadgets tracking brain activity. These devices will become more common as their accuracy and sophistication increase.

Donor tissues and organs will be grown in laboratories from biofibres that are not rejected by the body. As early as 2006, English scientists managed to grow a small












liver from cells taken from the blood from a baby's umbilical cord. Not long ago, a team of scientists from the universities of Sydney, Harvard, Stanford and Massachusetts Institute of Technology announced that

they had created an artificial section of the circulatory system. These technologies are still in their testing stage and are not used in actual surgeries, but this is a matter of little time.

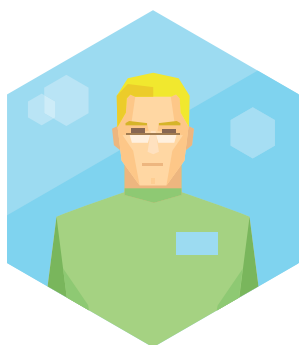
**POSSIBLE FUTURE CHALLENGES**

- Ultra-early diagnosis
- Development and management of high-tech medical equipment, including medical robots
- Technological design of medical equipment
- Design, creation and management of physiological databases
- Development of mobile diagnostic devices for self-diagnosis and ultra-early diagnosis
- Genetic analysis to choose a suitable treatment plan
- Computer simulation of disease development processes
- Genetic programming to preset parameters
- Development of personal insurance plans based on patients' genetic records
- Development and implantation of artificial functional devices and organs
- Development of individual diets
- Measures for aging population
- Development of marketing policies for medical companies
- Communication between research, diagnostic, treatment and prevention institutions
- Managing the life cycles of medical institutions
- Providing basic medical training for general public

CROSS-PROFESSIONAL SKILLS

 Systems thinking	 Intersectoral communication	 Project management	 Programming / Robotics / Artificial Intelligence
 Client focus	 Multilingual and multicultural abilities	 Interpersonal skills	 Ability to work under uncertainty
 Lean production	 Artistic skills	 Environmental thinking	



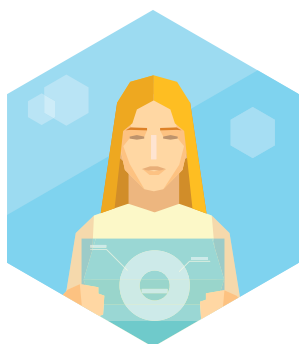


# MEDICAL DATA MANAGER

Specialist with good IT knowledge, building and managing physiological databases, and producing software for treatment and diagnostic equipment. The Big Data revolution is happening in healthcare nowadays, providing scientists with a priceless opportunity to quickly collect and analyze vast amounts of information. This means that a good medical database manager will never find himself without a job.



## CROSS-PROFESSIONAL SKILLS



# MEDICAL EQUIPMENT DESIGNER

Specialist in design and computer graphics, material science, strength of materials, machine parts, and electric appliances; capable of spatial thinking, understanding human anatomy and physiology, and is familiar with biocompatibility of materials and devices, and is an expert in medical and technical safety.



## CROSS-PROFESSIONAL SKILLS





# ONLINE DOCTOR

Highly qualified diagnostician, familiar with information and communication technologies, able to determine a diagnosis online. Focused on provisional diagnosis and prevention. These specialists may be involved in remote mass preventive medical check-ups, or provide support for data centers processing information from personal diagnostic devices and health portals. Online medical services are already a reality, and very soon doctors will be able to receive various data about a patient's health from wearable gadgets. Remote diagnoses will become more accurate, and instead of unconvincing online consultations conducted in a Q&A form, we will receive top-class services provided by well-trained specialists.



## SOCIAL DIARY

### 9:00 PATIENT RECEPTION SESSION OPEN

Flying to Moscow in an hour, still have a lot to do. Buy fridge magnets, for example.

### 11:00 3 PATIENTS DIAGNOSED

Friends gave me a medical reference as a present. And it's "analogue"! Leather binding, paper pages – regular antique stuff!

Saw a patient of mine at the airport. Said hello, but he just passed by. Think I'll have to buy a box of chocolates on my own.

### 12:00 5 PATIENTS DIAGNOSED

Remember reading somewhere that there used to be no Internet on planes. I wonder how passengers killed time during flights?

Met a gorgeous blonde! Too early for a diagnosis yet. :)

### 15:00 FLIGHT ROME – MOSCOW

#### 8 PATIENTS DIAGNOSED

They served dinner on the plane! Delicious! After all, airlines serve the best food!

Got a call from a friend. Going to Japan together tomorrow to climb mount Atago. Just imagine – consulting patients from 940 m above sea level, with an amazing view on Kyoto. Awesome!

### 19:00 PATIENT RECEPTION SESSION CLOSED. 14 PATIENTS DIAGNOSED.

**Provisional diagnosis: 4 patients**

**Final diagnosis: 8 patients**

**Clinical diagnosis: 2 patients**

Quite a fruitful day. Saved a few lives just by doing my job. A job I love.



## CROSS-PROFESSIONAL SKILLS



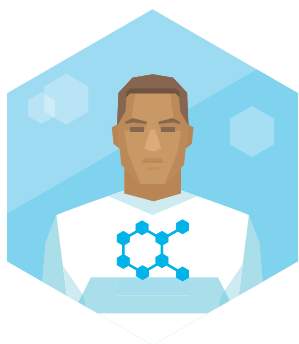


# GENETIC CONSULTANT

Conducts primary and scheduled genetic analysis in a diagnostic center, processes data from diagnostic devices, and provides an opinion and further treatment recommendations. Genetic analysis allows for the identification of cancer markers, diagnosis of hereditary diseases, determination of the specifics of a patient's metabolism and study of diseases caused by bacterial infections. The most popular genetic screening service is provided by U.S. company 23andMe. Commercial genome studies are conducted in Russia as well (although they are more expensive), for example, by companies such as Genoanalytica and Gene Family Health.



## CROSS-PROFESSIONAL SKILLS



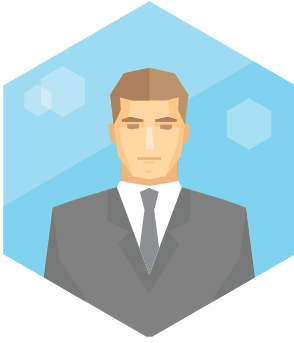
# BIOINFORMATICIAN

In case of unusual development of a disease, builds a computer simulation of the biochemical processes of the disease to understand its root cause (discovers irregularities at the cellular and subcellular level). The specialty has been around in the western countries for a few years and is aimed at making the fullest possible use of the entire load of accumulated information (genetic, biological and medical), to develop a personalized approach for a specific patient. Translational medicine is practiced in Russia as well, with experts predicting great numbers of jobs in the industry.



## CROSS-PROFESSIONAL SKILLS



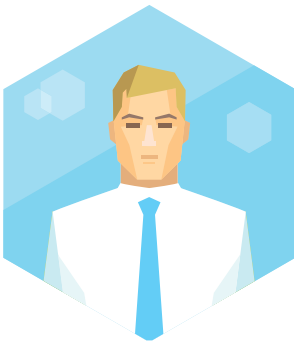


# MEDICAL MARKETING EXPERT

Specialist researching markets in pharmacology, medical services and medical equipment; develops marketing policies for companies and research centers. Another job that has existed in the world for a long time but is relatively new in Russia due to the Russian healthcare system being state-owned and state-managed until relatively recently. There are not a lot of jobs in this specialty. According to HeadHunter, there were only 6 vacancies in July 2014, but the job should be on offer in the future.



## CROSS-PROFESSIONAL SKILLS



# R&D MANAGER IN HEALTHCARE

Specialist providing communication between research, diagnostic, treatment and prevention institutions and managing cooperation programs and joint projects. His function is to put together an appropriate team of scientists, engineers, researchers and developers, focusing them on realizing potentially profitable ideas, and coordinating the entire joint process.



## CROSS-PROFESSIONAL SKILLS





# MEDICAL INSTITUTION LIFE CYCLE DESIGNER

Professional engaged in developing the life cycle of a medical institution or managing the same, from design to winding up. Today, hospitals are not just institutions providing a certain range of medical services. Activities related to R&D, education, training and mastering new technologies is playing an increasingly important part in the development of medical institutions. Managing sophisticated systems like these will definitely require proper specialists.



## CROSS-PROFESSIONAL SKILLS



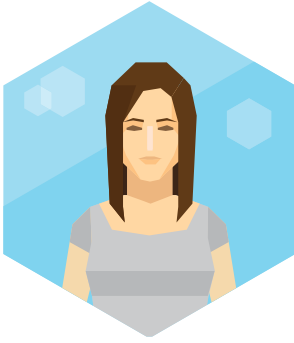
# OLD-AGE HEALTH CONSULTANT

Sociomedical expert developing balanced solutions for problems of the aging population. This specialist will help you adjust your lifestyle or choose a suitable diet and physical training. Growing life expectancy is increasing pressure on healthcare institutions, as retired persons require medical attention more often. Any government would benefit from the country's senior citizens maintaining healthy eating habits and a careful lifestyle.



## CROSS-PROFESSIONAL SKILLS





# MOLECULAR NUTRITION EXPERT

Specialist developing tailored diets based on molecular food analysis, taking into account the results of the genetic analysis of the patient and the specifics of their physiological processes.



CROSS-PROFESSIONAL SKILLS



# ROBOTIC PROSTHESIS AND IMPLANT DESIGNER

Develops artificial functional devices (robotic prostheses) and organs compatible with live tissues. This area is growing fast: implanted electric muscle stimulators are being developed for paralyzed patients; an implant appeared recently that functions as a natural eye; limb prostheses perform more and more complex functions. While prostheses and implants are most likely to be designed by dedicated specialists, actual implantation surgeries will be performed by re-trained surgeons, otorhinolaryngologists and ophthalmologists.



CROSS-PROFESSIONAL SKILLS





# MEDICAL ROBOT OPERATOR

Specialist in programming diagnostic, treatment and surgery robots. Robotic surgery began to develop as early as the 1980s. The most widely known robot surgeon, Da Vinci, is already used worldwide in various surgeries, from mitral valve reconstruction to spinal surgery. According to 2013 data, there are around 2,000 surgical systems of this kind in the world now.



CROSS-PROFESSIONAL SKILLS



# PERSONALIZED HEALTHCARE EXPERT

Studies the genetic record of a patient to develop tailored treatment plans (diagnosis, prevention, treatment) and offer respective medical insurance products. A logical continuation of the shift towards a tailored approach to treatment. Strong genetic analysis and forecasting capabilities will enable the prevention of many diseases before they require treatment, while awareness of specific risks will help to devise a customized insurance plan.



CROSS-PROFESSIONAL SKILLS





# TISSUE ENGINEER

Professional developing the technological process and selecting materials and conditions for the formation of a particular tissue or organ. The results of his work will be used by the transplantology surgeon.

job  
to emerge  
after 2025

after  
20 y.

## CROSS-PROFESSIONAL SKILLS



# GENE THERAPY EXPERT

Specialist in genome programming to predetermined parameters. Gene therapy (alteration of the human genetic apparatus to fight diseases) has been growing at an incredible pace in the past decade. While the method is mostly tested on animals, there have been cases of successful application of gene therapy on human patients. For example, in 2014, Great Britain announced that 6 patients suffering from choroideremia (hereditary genetic disease, still incurable and causes blindness) experienced eyesight improvement through the course of gene therapy. This is, however, only the first step. The next step is to modify the genome. There has already been an experiment to change two monkey genes.

job  
to emerge  
after 2025

after  
20 y.

## CROSS-PROFESSIONAL SKILLS







# BIOETHICIST

Specialist providing regulatory and ethical framework for medical, diagnostic and bioengineering centers engaged in transplantology and genetic modeling. No advanced laboratory will manage without advice from a bioethicist, especially in dealing with organ cloning and serious interference in embryo genes. It is not accidental that Yale University, a leading American school, has already launched a curriculum in bioethics at the faculty of medicine.



## SOCIAL DIARY

### 21/01 GOING TO SAN FRANCISCO TOMORROW

Going to San Francisco tomorrow to deal with the Erlich case. For those who don't know, a talented programmer has decided to sue his parents for genetic interference. They want him to grow famous and boosted his IQ to 150. Contrary to their expectations, the poor guy suffered his whole life from loneliness and isolation. Nevertheless, he succeeded in creating five high-profile startups.

[BBC. "John Erlich: 'Intellect has given me nothing but suffering.'"](#)

### 23/01 JOHN ERLICH WITHDRAWS CLAIM

Erlich had second thoughts and withdrew his claim after all. Which is a pity, because it would have made an interesting case.

### 30/01 REGULATORY CHANGES

Have you heard? The inheritance law has been amended again for children with three parents!

### 2/02 CONFERENCE ON GENETIC DISCRIMINATION

Visited a conference on genetic discrimination. For those who don't think the phenomenon exists, here is some statistical data from the U.S.: a most recent survey revealed that 74% of males with bad heredity admitted to have more difficulty starting a relationship with the opposite sex. It's time something was done about it.

job  
to emerge  
after 2020



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- N.I. Pirogov Russian National Research Medical University (RNRMU) (focus on customized healthcare, treatment)
- I.M. Sechenov First Moscow State Medical University(MGMU)
- Pavlov First Saint Petersburg State Medical University(SPbGMU)
- Nizhny Novgorod State Medical Academy (NGMA)
- Novosibirsk State Medical University (NGMU)
- Smolensk State Medical University (SSMU)
- Kuban State Medical University (KGMA)

## MEDICAL TECHNOLOGY EMPLOYERS IN THE RUSSIAN FEDERATION

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- Novartis Pharma
- Pharmstandard
- VEROPHARM
- R-PHARM
- BIOCAD
- Servier
- Pfizer International HCP
- NIZHPHARM
- Generium
- MEDSI
- SM-CLINIC
- INVITRO

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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Healthcare is a diverse field with a multitude of activities. The key employer on the medical services market is still the government, although the share of private medical clinics and laboratories – including online ones – is increasing. The pharmaceutical segment is occupied by medium and large Russian enterprises, as well as international companies often operating through dealers. The medical equipment segment is dominated by international companies, with a small share of Russian-produced equipment.



418 Вт.  
1134 Вт.

Искусство  
25° C / 58° F

Комбайн 1

Комбайн 2

Самый  
25° C / 58° F  
Минимум: 50° F

# AGRICULTURE

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## HOW IS THE INDUSTRY CHANGING?

The growing world population, which may increase by another two billion people by 2050, requires increasingly more food. For the humankind to avoid a global famine, as the one depicted in the science fiction film *Interstellar*, the agricultural sector will have to address a number of serious challenges.

First, the climate is changing, and agricultural technologies will have to adapt to new seasonal and weather conditions, including possible droughts, floods, and abrupt temperature changes. Another major problem is soil exhaustion. A solution may be found through aerobic restoration, which is a technology for saturating the soil with aerobic bacteria.

In addition, crop-farming diversity is declining: there are fewer new species of crops every year, with existing ones becoming extinct. This entails a need for deep research in artificial selection. GMO technologies allow for the breeding of new species with predetermined properties. For example, leading specialists are now working to create perennial grain crops that will help to reduce erosion, the fuel expenses of harvesters, and the use of pesticides and fertilizers.

The issue of a technical upgrade of the industry is especially topical for Russia, where the use of obsolete agricultural equipment is often the case. In the foreseeable future, robots and automated systems will help people in managing

farms and agricultural enterprises. Various sensors will remotely communicate precise information about weather conditions, soil humidity, and plant and animal conditions; unmanned agricultural aircraft will watch over the fields from above, while careful robotic harvesters will relieve people of tiresome labor and accelerate the harvesting process. So-called farmbots are already being used and, according to estimates by global experts, will be in mass use before 2020. With the help of ground sensors and aerial surveys, we will be able to develop the “precision farming” principle based on the notion that a field is heterogeneous, and to obtain maximum yield, with different parts requiring different treatment. At the same time, farming will stop being a purely rural domain, as cities will start building vertical farms, i.e. high-tech agricultural complexes on rooftops and in buildings.

Today, very few people think about the future and agricultural professions are not in high demand, but their prestige will grow over time. Technological innovations will allow efficient land utilization through reduced manual labor, while the growing complexity of the industry will change the requirements for the quality of human capital. Agricultural experts of the future will need systems thinking, developed management skills and knowledge of IT and biotechnology. Farmers will begin thinking as innovative businessmen, applying new

technological solutions to increase the efficiency of their farms.

Besides industry development, much attention is being devoted to environmental issues, and harmful fertilizers will be gradually

replaced with safe alternatives. Farming robots and smart systems will be gradually adapted to solar and wind energy. In the U.S.A., alternative energy sources are comparable in cost to traditional sources.

### POSSIBLE FUTURE CHALLENGES

- Automation and computerization of agricultural firms and farms;
- Operation of sophisticated robotic agricultural machinery;
- Design and control of complex automated agricultural systems;
- Development of competitive seed farming and breeding;
- Utilization of alternative energy sources in agricultural processes;
- Building relationships between specialists, businesses and the government in the agricultural industry;
- Research and development on the intersection of biotechnology, informatics and robotics;
- Environmental monitoring.

#### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



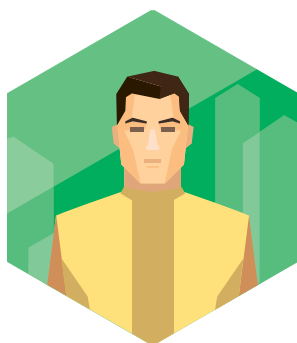
Lean production



Artistic skills



Environmental thinking



# AGRICULTURAL INFORMATICS AND ENGINEERING EXPERT

Highly qualified specialist in the implementation of new technologies, engaged in computerization and automation of agricultural facilities.



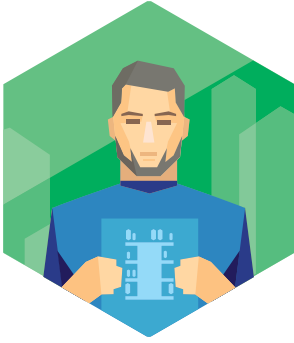
## AGRICULTURAL ENGINEERS' CHATROOM

- 13:56 DEAN84:**  
Guys, bad news: our Greendale has failed the first tests. First, the drone's GPS is faulty, causing it to fly in curious patterns over the field instead of scanning evenly. Second, it messed up the soil acidity analysis and diffused fertilizers in the wrong places. We must do something about it quickly. Sasha? Ann?
- 13:58 HOTORN:**  
Everything worked well at my dacha.
- 14:02 ANNIE:**  
I'll take a look. By the way, Lesha, I've come up with a way to improve the efficiency of the solar batteries, so they can hold the charge four hours longer.
- 14:03 STAR-BURNS:**  
What kind of patterns are they?
- 14:13 DEAN84:**  
Ann, cool, let's discuss it.  
Vasya, stick to your mango apples: we are making a presentation to Krasnodar farmers the day after tomorrow, and you still haven't handed in your latest research report.
- 14:18 STAR-BURNS:**  
I've been on it for seven hours! Give me a break.
- 13:58 PELTON84:**  
Get some coffee in the kitchen – the one we got from the Seoul firm: their coffee beans now contain taurine as well as caffeine.
- 14:02 ANNIE:**  
Yeah, while they tested the harvest, they managed to complete three new projects and launch a hip-hop class for their employees.
- 14:03 HOTORN:**  
That's it, coffee break.



## CROSS-PROFESSIONAL SKILLS





# CITY FARMER

Specialist in outfitting and maintaining agro-industrial facilities in skyscrapers and on their rooftops in big cities. Vertical farms are sustainable and eco-friendly structures enabling crop and animal farming within city limits. They are also on the agenda of the near future. The first commercial vertical farm was built in Singapore in 2012. Skyscraper farms are now planned in South Korea, China, UAE, USA, France, and other countries.



## SOCIAL DIARY

### 11/06 GOT THE JOB OF MY DREAMS!

Moving to the world's largest city farm in South Korea in two weeks. 150 floors of pure delight!

### 15/06 KOREAN ALPHABET

Did you know that Koreans write in letters and not in hieroglyphs? That's right, there are as many as 51 of them in the alphabet.

But that's OK, I'll do my best. English is going to be enough for me in my work.

### 25/06 ARRIVED IN SEOUL

Everything is very unusual here. Had dinner in the N-Seoul tower. It's half as high as the Ostankino Tower, but the view over the city is simply amazing. Tomorrow is my first day at work.

### 26/06 AT THE NEW WORKPLACE

My colleague Lee Kim showed me around the farm. Apricots, pears, strawberries, fresh vegetables, even timber fungus! I can't believe we're in the center of a metropolis!

### 27/06 HERE ARE MY CHARGES!

Orange groves. They overdid it with the irrigation though, so I had to adjust the system on a few floors.

### 1/07 RABBITS AT LARGE

The guys from the 112<sup>th</sup> floor had an accident today: a couple of rabbits somehow managed to escape from the unit. Good thing they didn't make it to the rare vegetables unit, or else we would have a new Australia on our hands.

job  
to emerge  
before 2020



## CROSS-PROFESSIONAL SKILLS







# AUTOMATED FARMING EQUIPMENT OPERATOR

Specialist managing automated machinery at a farm: sensor systems, drones, and farmbots.



CROSS-PROFESSIONAL SKILLS



# AGRICULTURAL ECONOMIST

Highly qualified specialist ensuring the competitive performance of products and cost-efficient operation of agricultural companies; adjusting operations of an enterprise to suit the needs and requirements of the market. Responsible for managing a firm's economic risks. While a few schools do provide training in the specialty, demand for it still exceeds supply on the job market.



CROSS-PROFESSIONAL SKILLS



# AGRICULTURAL ECOLOGIST

Expert in waste disposal, i.e. in developing the principles of agricultural waste disposal and soil restoration.



CROSS-PROFESSIONAL SKILLS





# GMO FARMER

Specialist in the application of genetically modified products in agriculture; engaging in the implementation of biotechnological achievements and creating products with preset properties, In spite of the public debate around the subject, most scientists believe GMOs to be harmless, which is why the use of GMOs keeps growing: in 2013, over 11% of the world's cultivated land is sown with genetically modified crops, while 91% of soybeans, 88% of cotton, and 85% of corn in the USA are genetically modified. In Russia, GM seeds have been subject to registration since 1 July 2014. The first harvest of genetically modified soybeans is scheduled for 2016 and 2017, and the profession is sure to be in demand at the time.

job  
to emerge  
after 2015

after  
20 y.

CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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Agricultural colleges, academies or universities are present in almost every constituent of the Russian Federation. Here we have included only a few of the universities that offer the most comprehensive base of knowledge, skills and expertise.

- Russian State Agrarian University (K.A.Timiryazev Moscow Agricultural Academy)
- M.V.Lomonosov Moscow State University (faculties of biology and soil science)
- Far East State Agricultural University
- Research Institute of Plant Industry
- N.I.Vavilov Institute of General Genetics of the Russian Academy of Sciences
- Novosibirsk State Agricultural University
- Krasnoyarsk State Agricultural University
- N.I.Vavilov Saratov State Agricultural University
- Saint Petersburg State Academy of Veterinary Medicine
- Saint Petersburg State Agricultural University
- Michurin State Agricultural University

## POWER GENERATION EMPLOYERS IN THE RUSSIAN FEDERATION

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Almost every region of the country has a lot of employers in agriculture. Here is an incomplete list of them.

- Razgulay Group
- Rusagro Group
- Agroholding Group
- Eurodon
- EkoNiva-APK Holding
- Miratorg Agribusiness Holding
- Yug Rusi Agro-Industrial Group of Companies
- Aston
- Prioskolye
- AGRICO Group
- Russkoe moloko



# CONSTRUCTION

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## HOW IS THE INDUSTRY CHANGING?

Construction is one of the vital infrastructural branches, responsible for economic development and the everyday comfort of the population. The industry is one of the leaders in terms of jobs in the country. Meanwhile, modern construction requirements are leading to its significant transformation.

Changes in this area take a long time to happen. Nevertheless, standard and custom construction projects are beginning to utilize advanced materials to provide higher comfort, environmental safety and operational cost-efficiency (e.g. reduced energy consumption). Advanced materials enable new architectural and design solutions that were impossible to implement before. For example, optical fiber concrete will make rooms brighter; carbon fiber will allow flexible structures; kinetic glass will control oxygen levels by “inhaling” air from the outside and “exhaling” it back. Some traditional materials, such as wood, are back in demand. More and more large structural elements will be prefabricated at factories, to be assembled into a building at the construction site.

On the other hand, traditional labor is being replaced by 3D printing technologies. Behrokh Khoshnevis, Professor at the University of Southern California, invented a layer-by-layer printing method, which he expects to allow for the “printing” of entire concrete buildings. A portable structure, taller than the house to be built, will be able to recreate a building to a particular

drawing in 20 hours. The technology will be perfect for emergency construction, e.g. after acts of God, or for construction of affordable housing. London Architectural Office Foster+Partners is working on a lunar home project. A tube frame with an inflatable dome will be coated with a special foam material by a robot equipped with a 3D printer. The material will be produced on the spot, from moon soil mixed with magnesium oxide. Similar technologies can be applied in mass construction on Earth.

In standard construction, the processes of designing, erecting and operating buildings are becoming automated. New buildings are constructed to suit energy efficiency and smart environment requirements. Along with technologies allowing automation of standard construction, a market for personalized homes will also develop. Customers of tailored projects will be more actively involved in the planning and construction process.

Growing mobility will lead to the popularity of easily transportable houses. Aside from variously equipped wheeled mobile homes, building block houses will appear that can be easily and quickly assembled from prefabricated elements. Another area is turnkey construction of cities, i.e. with all the buildings, utilities and other amenities.

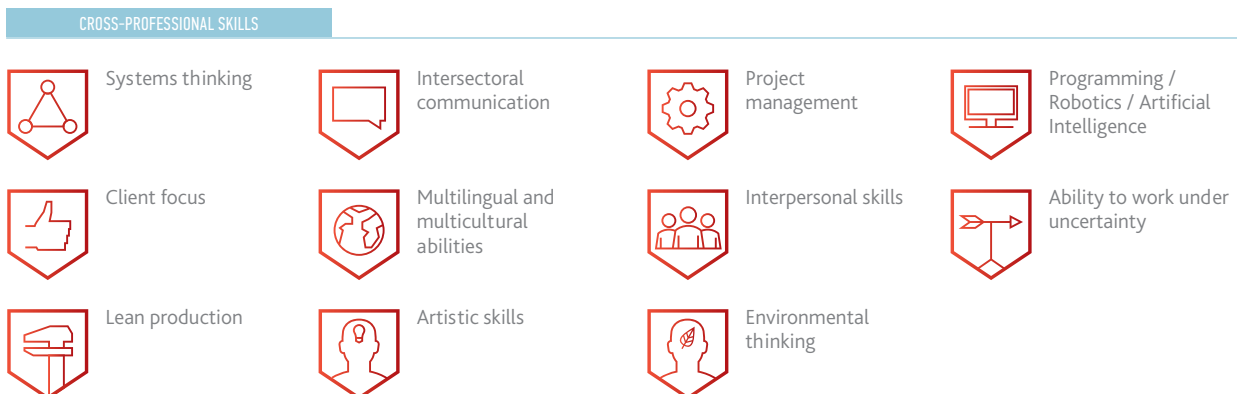
New industrial methods and advanced materials will allow for increases in labor productivity and will make the industry safer.

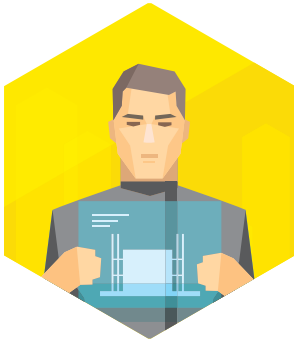
**THE MOST PROMISING AREAS IN THE INDUSTRY:**

- Digital design and process preparation
- Construction materials with preset properties
- Building blocks (houses, utility buildings, etc.) for the mass consumer (LEGO and IKEA houses that a family can build from parts on their own)
- Technologies for integration of digital environments within residential and commercial buildings (smart houses)
- 3D printing in construction
- Outsourcing of remote construction processes (technology enabling remote technical supervision, work management and project interaction).
- Earth processing and materials for 3D printing (excess earth from construction sites can be used as a consumable material for 3D printers)
- Bioprocessing of waste matter into materials to eliminate waste. For example, recycling of sewer waters and solid waste into various materials and energy

**POSSIBLE FUTURE CHALLENGES:**

- Replacing traditional construction technologies with advanced technologies
- 3D modeling of buildings
- Design of smart environments for residential buildings
- Calibration and adjustment of smart environments for residential buildings
- Selection (or development) of advanced materials to solve specific construction issues (from renovation of aging buildings to construction in extreme conditions of polar regions)
- Design of sustainable housing
- Design and modeling of 3D-printed houses





# SPECIALIST IN OLD STRUCTURE RENOVATION/ REINFORCEMENT

Determines the degree of wear and tear of structures and buildings, selects solutions (including the use of advanced materials) for their renovation and reinforcement. The specialty is especially popular in the reconstruction of historical city centers.



## CROSS-PROFESSIONAL SKILLS



# CONSTRUCTION TECHNOLOGY UPGRADE SPECIALIST

Professional with a good knowledge of advanced construction technologies (e.g. structures made of advanced materials used to upgrade existing buildings and structures, utilization of advanced solutions for electricity and water supply, water discharge and air conditioning in offices, residential buildings, etc.), and promoting them in the industry and implementing them in particular projects.



## CROSS-PROFESSIONAL SKILLS





# SMART HOUSE INFRASTRUCTURE DESIGNER

Specialist in the design, installation and adjustment of smart home management systems (e.g. appliances, security systems, electricity and water supply systems, etc.). Smart homes are appearing already. However, the job is not likely to become popular until seven to ten years from now.



CROSS-PROFESSIONAL SKILLS



# FOREMAN WATCHER

Construction specialist using digital structure designs. Can use image recognition systems to evaluate the construction progress and adjust the process based on the data analysis.



CROSS-PROFESSIONAL SKILLS







# BIM MANAGER DESIGNER

Specialist involved in the entire life cycle of a project. Building Information Modeling (BIM) is the gathering and comprehensive processing of all architectural, constructional, technological, economic, and other data about the building, with all relations between them, in a design that treats the building and everything related to it as a single object.



## CROSS-PROFESSIONAL SKILLS



# ACCESSIBLE ENVIRONMENT DESIGNER

Specialist in the development of infrastructural solutions for children, senior persons and disabled persons around properties (e.g. playgrounds, elevators for the disabled, signboards for people with impaired eyesight, ramps, recreational space, etc.).



## CROSS-PROFESSIONAL SKILLS





# ENVIRONMENTAL ANALYST IN CONSTRUCTION

Specialist who designs a construction site in terms of its environmental impact in order to advise companies on solutions the least harmful for the environment.



CROSS-PROFESSIONAL SKILLS



# 3D PRINTING DESIGNER IN CONSTRUCTION

Designs structure models and selects the best sets of components for their printing; supports the house printing process.



CROSS-PROFESSIONAL SKILLS





# ZERO ENERGY HOUSE ARCHITECT

Specialist engaged in the design of sustainable buildings, fully self-sufficient in terms of power thanks to microgeneration technology (alternative energy sources, trigeneration, i.e. using three energy sources at once: electricity, heat and cold), and utilization of energy-saving materials and structures.



## LETTER FROM A ZERO ENERGY HOUSE ARCHITECT

To: Son [egor2024@extramail.ru]

From: Me [arch@allinhose.com]

Subj: from dad

Hey son!

How are you getting along? Mom says you won the city-wide competition in English. I'm very proud of you. My project is almost finished and I should be back home in just over a month.

You asked me to tell you in detail what I'm doing. As I said earlier, I design "zero houses", that is, the kind that do not require external energy sources. In winter they are warm without central heating, and in summer they are cool without air conditioners.

How can this be done? First, you need to design an appropriate shape for the house and work out the layout of windows and doors, based on cardinal directions. The shape and area of the roof are also important, as houses of this kind usually have solar panels installed on their rooftops. Second, you need to ensure air-tightness and add heat insulation, so that the cold will not get inside the building. Aside from that, you need to think through the ventilation system, rainwater collection system, and many other things.

I think my project has turned out very well. It will also be a very eco-friendly and comfortable house. I hope we can build one like it for ourselves some time.

Greetings from Sweden,  
Dad

job  
to emerge  
after 2020



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Moscow Architectural Institute (MARHI)
- Moscow State University of Civil Engineering (National Research University)
- Southern Federal University (YuFU)
- V.V.Kuybyshev Far Eastern State Technical University (DVGTU)
- Saint Petersburg State University of Architecture and Civil Engineering (SPbGASU)
- Urals Federal University named after the first President of Russia B.N. Yeltsin
- Nizhny Novgorod State University of Architecture and Civil Engineering (NNGASU)
- Courses led by collective use centers / fablabs (teaching 3D printing technologies)

## CONSTRUCTION EMPLOYERS IN THE RUSSIAN FEDERATION

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### INDUSTRIAL AND MILITARY CONSTRUCTION

- Oboronstroy (and 66 affiliated Russian companies)
- Sroytransgaz
- Globalstroy-Engineering
- E4 Group

### CIVIL CONSTRUCTION

- SU-155
- PIK
- Morton
- Glavstroy
- Renova-Stroy Group
- Tashir

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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This is one of the mass industries where specialists will remain in demand for a long time to come. Most companies in the sector are privately owned medium and large companies performing various types of jobs, from design to construction and operation. Additionally, many industrial companies in power engineering, extraction, transportation, etc. are equipped with their own engineering and construction divisions.



# ENERGY GENERATION AND STORAGE

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## Vyacheslav Pershukov

Deputy CEO for Innovation Management, state corporation ROSATOM

The main purpose of the corporation is to provide a business structure to operate on the global market, where we offer advanced technologies and innovations for any other branch, including the nuclear industry. We strive to train engineers with an integrated market approach and a focus on the concepts of intellectual property and intellectual product marketing. Combining innovative economic management with knowledge about the micro world is one of our key objectives at the current stage.

## HOW IS THE INDUSTRY CHANGING?

Electricity, quite naturally, has long been perceived as the “blood of the economy”. Our dependence on this branch will only increase with the growing number of devices around.

The nuclear power industry will become one of the symbols of the new environmentally conscious society, as it can ensure stable electricity prices and minimal impact on the environment, avoiding carcinogenic and greenhouse gas emissions, or the specific adverse effect of coal and oil fuel power plants that still occupy a significant share of the traditional power market. The number of power plants in the world will increase, and their safety will be greatly improved. Advanced technologies will be utilized to reduce nuclear waste.

At the same time, private alternative energy (micro wind generators, solar panels,

etc.) will also develop. According to European Commission estimates, 2.8 million jobs will be created in the European renewable energy sector by 2020. Even now, wind generators produce 28% of Denmark’s electricity, while 7% of Germany’s electric power is provided by solar panels.

This will lead to people across the globe producing their own power and redistributing or selling the surplus (see Power Grids and Power Consumption Management). Power generation, transfer and storage processes will eventually become automated, requiring little or no human involvement. The power supply principle of mobile devices, which are a part of our everyday life, will also change, with a large portion of energy to be transmitted from the body of the user via generators sewn into clothes and footwear.

## WHAT WILL BE THE BREAKTHROUGH POINTS IN POWER GENERATION WITHIN THE NEXT 20 YEARS?

- Cogeneration is the utilization of energy from several outlets during a technological process.
- New power generation methods. We will be able to charge our gadgets using our body heat or kinetic energy of motion (there is already a bicycle-mounted phone charger), capture solar energy from the surfaces of city buildings, or recuperate the energy of exhaust, water, and motion, as well as to generate it using biofuels. Some options are even more exotic. For example, Nokia and the Cambridge Research Center are already working on a “perpetual” smartphone battery powered by electromagnetic waves.
- Energy storage devices: high-capacity storage units for smart grids and wearable high-capacity batteries for end users.
- Fast neutron reactor (reduced waste and improved waste disposal technology).
- Thorium-based technologies (thorium is a very common element which, unlike uranium, does not produce waste that needs to be stored for a long time).
- Thermonuclear fusion.

## POSSIBLE FUTURE CHALLENGES

- Upgrade of power generation systems
- Design of energy storage systems
- Construction and implementation of micro (for individual users) and local (for households and small generation companies) generation
- Design of micro and local generation systems
- Optimization of power generation system operation modes

### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



Lean production



Artistic skills



Environmental thinking





## POWER GENERATION SYSTEM UPGRADE MANAGER

Manages upgrade of central heat and power plants, hydro power plants, and nuclear plants; implements advanced safety, sustainability and resource efficiency methods. In spite of the general trend toward the diversification of electric power sources, the lion's share of electricity will still be produced centrally in the near future. Equipment ages and wears down, entailing a need for professionals able to introduce the best practices at power plants and CHPs. Major players in the power market, such as Siemens, already provide services for upgrading generation systems, which means their demand for respective specialists will grow over time.



### CROSS-PROFESSIONAL SKILLS



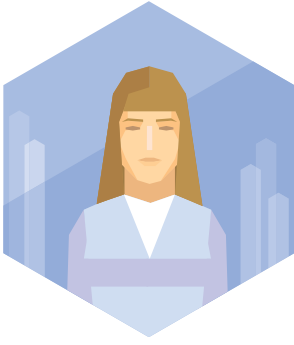
## MICRO GENERATION SYSTEM DESIGNER

Specialist in the development and design of advanced technological solutions for micro generation, tailored to user needs. Micro generation is developing intensively around the world, including Russia. However, in frequent cases, standard solutions cannot be adopted due to specific reasons, such as climatic conditions, requiring specialized systems meeting any types of requirements.



### CROSS-PROFESSIONAL SKILLS



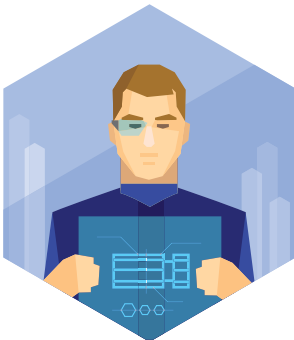


# RECUPERATION SYSTEM DESIGNER

Specialist in technological solutions for capturing the excess energy of moving vehicles, especially when braking, e.g. automobiles, metro trains, or electricity-driven mass transit vehicles. Energy recuperation is not a revolutionary field: rail transport, trams and trolleybuses already use recuperative braking systems. The technology will remain popular for a long time to come, and demand for specialists able to build such systems will increase.



## CROSS-PROFESSIONAL SKILLS



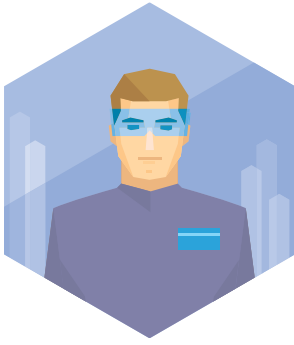
# ENERGY STORAGE DEVICE DESIGNER

Specialist involved in designing various energy storage systems: high-capacity batteries, heat accumulators, flywheels, etc., enabling energy storage for redistribution in smart grids between peaks and troughs. Efficient power generation is only half of the job's success, as solutions need to be developed for its efficient utilization and storage. For example, recuperative braking systems used in electric cars charge the battery, but excess energy is wasted. An energy storage device designer must bear this in mind. Major energy storage device projects are already underway. For example, in September 2014, Germany launched Europe's first 5 MW storage station. Its main purpose is to stabilize the electricity supply in case of uneven load in the grid. It is able to manage the task much faster and more effectively than heat power plants, which are traditionally used for this purpose.



## CROSS-PROFESSIONAL SKILLS



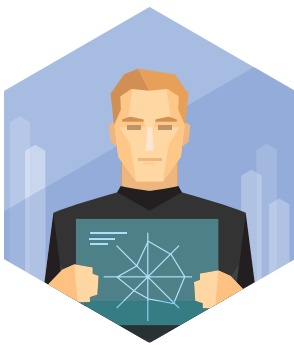


# LOCAL POWER SUPPLY SYSTEM SPECIALIST

Develops, implements and maintains small power generation systems (wind solar, bio-, nuclear micro generators, etc.). The main reasons behind the development of micro generation today are the growth of environmental consciousness and reduction of consumer spending. Western countries have already recognized the job, with the trend expected to reach Russia soon. The job will be posted by owners of country houses and vertical farm designers.



## CROSS-PROFESSIONAL SKILLS



# WEATHER EXPERT IN POWER INDUSTRY

Specialist in generation facility operation management based on weather conditions, predicting power generation levels depending on long-term forecasts. Steps are already being taken to prepare the ground for the new job. For example, the Electric Reliability Council of Texas (ERCOT) bases its predictions regarding loads on generation facilities on long-term weather forecasts.



## CROSS-PROFESSIONAL SKILLS





# WEARABLE POWER DEVICE DESIGNER

Designer of mobile/wearable power generation systems. Creates personal items (including clothes and footwear) with micro generation capabilities. Already, there are street clothing items equipped with solar batteries, such as the Ecotech jacket created by Italian company Zegna Sport.



## SOCIAL DIARY

### 10/09 GOING TO LONDON FASHION WEEK TOMORROW

A show of our collection created jointly with the Japanese designer Yasumoto. My favourites are the silver dresses with solar batteries. They are decorated with LED tapes that light up at nighttime, using the power generated during the day.

### 12/09 LOVE AND OLD TECHNOLOGY

Mom said she first had a good look at Dad at the university, when she asked him for an iPhone charger, and they started talk. So touching! You can hardly imagine something like this today. How did your parents meet?

### 13/09 IT USED TO BE ALL THE WAY AROUND

Fancy this: fitness bracelets used to be charged by other gadgets, and not vice versa. This must have been so unhandy!

### 14/09 CAPSULE COLLECTION FOR NIKE

Working on a capsule collection for Nike together with the new sprint star Adeola Ronga. I wish you could have seen her – she is the liveliest girl I know.

job  
to emerge  
after 2020



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- National Research University *Moscow Power Engineering Institute*
- N.E. Bauman Moscow State Technical University (BMSTU)
- Moscow Institute of Physics and Technology (MIPT)
- National Research Nuclear University MEPHI
- Kazan State Power Engineering University
- Ivanovo State Power University

## POWER GENERATION EMPLOYERS IN THE RUSSIAN FEDERATION

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- Rosatom Group
- Gazprom
- RusHydro
- EuroSibEnerg
- Enel OGK-5 (ENEL)
- Geotherm

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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The traditional power generation sector is currently represented by a small number of major companies. Those who opt for nuclear power engineering are most likely to end up working for the major Russian state corporation Rosatom. A similar situation is observed in the other power generation segments: hydropower – RusHydro; gas generation – Gazprom. The alternative energy field (wind, solar generation, biofuel, etc.) is, on the contrary, represented by a large number of private medium businesses.





# POWER GRIDS AND POWER MANAGEMENT

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## Roman Berdnikov

First Deputy Director General for Technical Policy, Russian Grids

Combined management methods are the future of the power industry. There is demand for interdisciplinary knowledge and interfaces between adjacent sectors. The power grid industry lacks traditional engineers. In past years, the progressively poorer understanding of the subject and deviation from traditional industry knowledge has been preventing us from implementing new technologies. Nevertheless, integration is happening, and technologies are developing despite the various barriers that we will undoubtedly overcome. Barriers include lack of foreign language competence, low stress resilience and no awareness of new technologies.

## HOW IS THE INDUSTRY CHANGING?

If electricity is the blood of the economy, then power grids are the circulation system. The world is growing in complexity, with increasing requirements for power grids and demand for respective jobs.

The key changes in power grids and power consumption are linked with smart grid technologies. These are grids with intelligent control systems that allow, based on the power consumption level in a building/office (precisely determined by equipment, lights and electric sockets), for the setting of optimal operation modes (e.g. washing clothes at night, when power rates are lower). They can also quickly respond to any problems (e.g. voltage surges), thereby preventing damage to equipment, and automatically recover after a breakdown.

These technologies reduce losses in power delivery systems and make power delivery more reliable and increase continuity. They can also help consumers choose an energy supplier and manage consumption and spending. In

addition, users who own their own micro generators may have surplus power to sell.

Another trend is the evolution of distributed generation. A total blackout is a favourite device of writers in disaster films: insidious hackers or natural calamities disrupt power mains and a whole city falls into darkness. Distributed power allows for the prevention of such a scenario, as local accidents in separate grid sections will not lead to global implications. Developed countries have put it on their active agendas as far back as the 2000s: in particular, the USA passed a law offering considerable benefits to small electricity producers after a major accident in the power system on the north-east of the USA and in Canada in 2003. The share of centrally produced electricity has been declining since then. There are no equivalent initiatives in Russia yet, but as companies lack funds to upgrade the mains, distributed power may become a topical issue in Russia in the near future, creating a need for respective specialties.

## WHAT ARE THESE CHANGES LEADING TO?

- New power supply management interfaces will appear for flats, houses, and large facilities (via computers, smartphones, etc.).
- Grids will be controlled with the help of high technology (including artificial intelligence).
- Smart sensors and devices adapting to power loads will become fairly common.
- Electric charging systems for road vehicles and small aircraft will proliferate and improve. Electric cars have been gaining popularity across the world lately due to the continuous increase in oil prices.

## POSSIBLE FUTURE CHALLENGES

- Smart grid design
- Smart grid management
- Power consumption optimization
- Power consuming system design
- Power consumption control
- Training for electricity consumers
- Work on the power market
- Design and management of power consuming system infrastructure (electric car chargers, etc.)

### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



Lean production



Artistic skills



Environmental thinking

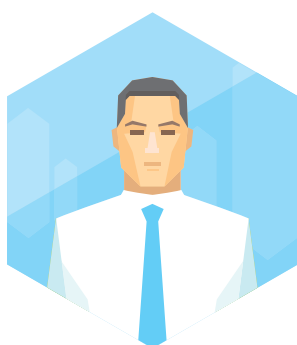


# POWER MARKETING EXPERT

Specialist with a good knowledge of the Russian and global power market, dealing with power sales. Need for the profession is caused by the increasing competition on the power market and emergence of a large number of private businesses. There is no demand for it in Russia as of now, but issues of micro generation and distributed grids will become highly topical very soon. In the west, however, the specialty of power marketing expert is quite developed.



#### CROSS-PROFESSIONAL SKILLS



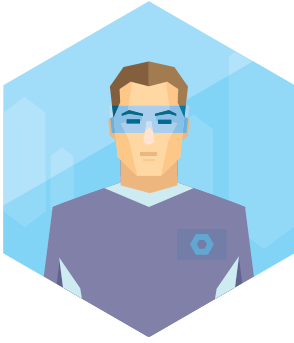
# ELECTRICITY CONSUMER RIGHTS EXPERT

Checks power grids for compliance with safety, efficiency and other user requirements, providing professional advice on energy saving legislation. Europe and the USA have a carefully elaborated system of electricity consumer rights protection, with many experts on the subject, who commonly provide advice on how to pay less for power. The service will become sought-after in Russia as well, not least of all to make sense of all the complex benefit and subsidy schemes, which are the subject of complaints even from professionals.



#### CROSS-PROFESSIONAL SKILLS



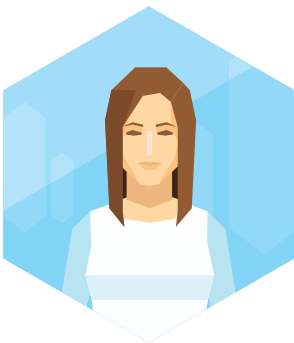


# POWER GRID ADJUSTER/ CONTROLLER IN DISTRIBUTED GENERATION

Specialist analyzing potential system failures, designing the most efficient operation modes, and ensuring the designed safety of power grids and waste disposal. Familiar with non-destructive control methods and smart grid commissioning.



## CROSS-PROFESSIONAL SKILLS



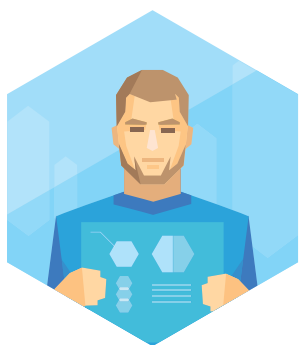
# ENERGY AUDITOR

Professional engaged in auditing and consulting in power consumption. Inspects private homes, residential blocks, detached buildings and factories for energy losses and provides recommendations on power consumption optimization. Energy audit already exists as a licensed activity. The job is quite popular, with 845 vacancies in July 2014, according to HeadHunter. Demand for these specialists will rise even higher in the future.



## CROSS-PROFESSIONAL SKILLS



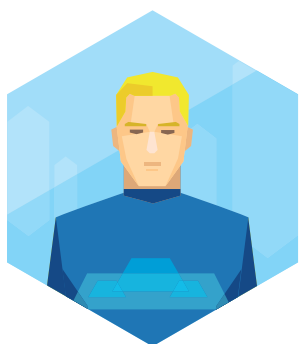


# SYSTEM ENGINEER FOR SMART POWER GRIDS

Specialist tasked with designing and modelling smart grids, micro generation systems, and smart power environments for various purposes; develops technological and infrastructural requirements to systems throughout their life cycle. Provides solutions for the same task as the designer of power consuming systems, but on the end of power supply. There are foreign companies that provide the service (e.g. Siemens offers the SureGrid service, enabling real-time power consumption control within a specific building).



#### CROSS-PROFESSIONAL SKILLS



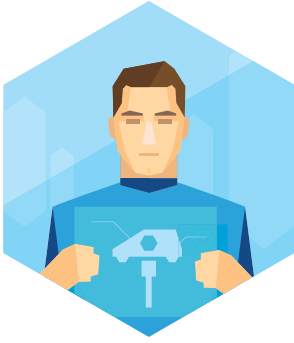
# POWER CONSUMPTION SYSTEM DESIGNER

Specialist working to maximize the comfort and power efficiency of user environments. This system designer advises on the best tools to use in a particular situation and what to do with the most power-intensive household appliances, such as the air conditioner or refrigerator.



#### CROSS-PROFESSIONAL SKILLS





# ELECTRIC VEHICLE CHARGING STATION OPERATOR

Specialist servicing the infrastructure for charging electric cars and other vehicles (e.g. unmanned cargo aircraft). The US has the best developed grid of this kind at the moment, with around 7,000 charging stations.



CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- National Research University Moscow Power Engineering Institute
- Tomsk Polytechnic University (TPU)
- Novosibirsk State Technical University
- Peter the Great Saint Petersburg Polytechnic University

## POWER GRID TECHNOLOGY EMPLOYERS IN THE RUSSIAN FEDERATION

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- Russian Grids, major power grid company in Russia and globally, including:
  - Federal Grid Company of Unified Energy System
  - Moscow United Electric Grid Company (MOESK)
  - Kubanenergo
  - Yantarenergo
  - Tomsk Distribution Company
  - IDGC of Center and Volga Region
  - IDGC of Centre
  - IDGC of Siberia
  - IDGC of the South and others.
- IES-Holding
- E.ON Russia
- Moscow United Energy Company





# ROAD TRANSPORT

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## HOW IS THE INDUSTRY CHANGING?

People travel more and more every year, enhancing the role of the transport industry. We travel short and long distances more frequently and impose more stringent requirements on the speed, comfort and cost efficiency of our journeys. In Russia, road transport has traditionally ensured the unity of our immense country, although there has not been much change in the industry in the past decade. Nevertheless, global competition will force Russia to adopt new methods of road construction and transport management.

Intelligent systems are becoming an essential part of transport infrastructure, both in terms of traffic management and vehicle control. Computers are taking over logistics. Unmanned vehicles will soon appear on the roads, safer and more predictable than traditional ones. According to Google estimates, they will bring about a 90% reduction in the number of road accidents, fuel expenses and overall traffic volume, as well as allow the driver to read a book or watch a movie instead of having to watch the road all the time.

Materials and surfaces are becoming intelligent, along with the hardware: adaptive road surfaces (equipped with sensors and solar panels), lightweight heavy-duty structures and high-tech lining for vehicles and carriages are already in use. Smart roads will replace map-making services by directly

transmitting information about the traffic situation ahead (jams, ice, accidents, etc.) to drivers. This will enable more effective route planning and timely decision making. It is an ideal solution, taking into account the anticipated proliferation of unmanned vehicles.

The state of Virginia (USA) already has its own Virginia Smart Road, equipped with a lighting control and weather monitoring system, sensors tracking humidity, temperature, vibration and weight of cars passing by. The length of the experimental section is just 3.5 km, but there are plans to extend it to 9.2 km.

Movement speed is increasing, especially in railway transportation, which allows it to compete with aviation at short distances. The fastest train in the world today is the Japanese JR Maglev magnetic levitation train that can cover a distance of 581 km in an hour. The innovative train is undergoing testing on an experimental 18 km section, which will become part of a high-speed line from Tokyo to Osaka in the future. There are also various alternative projects and ideas for the transport industry. Russia, for example, is working on a string transport project, a transportation system where light carriages will move on thin "string" rails stretched between supports. Trains in the system will be able to move at speeds of up to 500 km/h. For example, a journey

from Moscow to Nizhny Novgorod will only take an hour, and a trip from Moscow to Saint Petersburg will last only an hour and a half. In turn, entrepreneur Elon Musk, who founded the first privately owned space company SpaceX, is planning to build

a “hyperloop”, a passenger transportation system where people would travel in small capsules inside a low pressure pipeline. According to his estimates, the average speed of a capsule in the system will exceed 900 km/h.

### WHAT WILL APPEAR IN OUR LIVES AS A RESULT OF THESE CHANGES?

- High-speed railway transport
- Global freight logistics (including based on RFID tags, i.e. a recognition system now used for metro tickets)
- Unmanned passenger cars and trucks
- Smart roads with adaptive surface
- Electric cars in cities
- Cargo scanning without unpacking

### POSSIBLE FUTURE CHALLENGES

- Design and management of transportation systems (including unmanned variants)
- Design of automated transport management systems
- Transportation system safety
- Design of cross-logistical systems
- Intermodal hub design
- Intermodal hub servicing
- Smart road design
- Application of advanced materials in road transport
- Design of high-speed railways

#### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



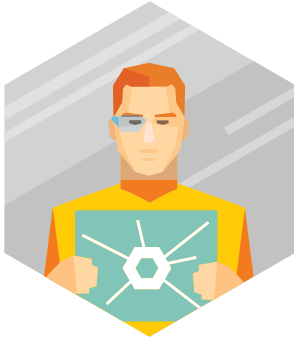
Lean production



Artistic skills



Environmental thinking

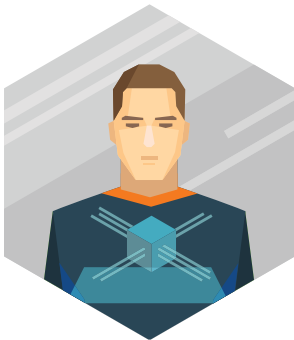


# CROSS-LOGISTICS OPERATOR

Professional with a competence in selecting the best methods of cargo and passenger delivery using different modes of transportation; control and adjustment of traffic throughout a multimodal network; monitoring of the passability of transportation hubs; redistribution of traffic flows in transportation networks.



## CROSS-PROFESSIONAL SKILLS



# INTERMODAL HUB DESIGNER

Designs intermodal hubs (systems for changing between modes of transportation), calculates their cargo and passenger capacity, wear resistance, and evaluates their growth potential. Such specialists already exist in Russia as well as in the West, however, the increasing load on the transport infrastructure and growth of passenger and cargo traffic will boost demand for them significantly in the future.



## CROSS-PROFESSIONAL SKILLS





# INTERMODAL TRANSPORT TECHNICIAN

Services technologically heterogeneous transportation structures, intermodal cargo and passenger hubs, infrastructure and station facilities.



CROSS-PROFESSIONAL SKILLS



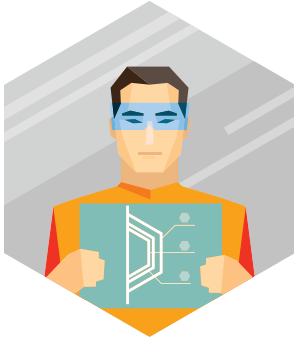
# HIGH-SPEED RAILWAY DESIGNER

Professional that designs tracks, junctions and stations for high-speed railway systems, taking into account regional and climatic specifics. Specialists of this type are already being trained in western countries. In particular, Michigan Technological University offers courses in this field.



CROSS-PROFESSIONAL SKILLS



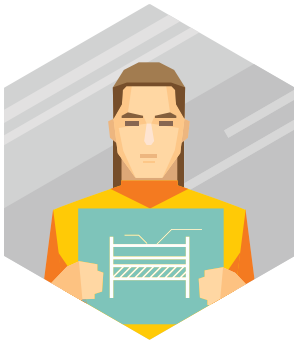


# DESIGNER OF COMPOSITE STRUCTURES FOR VEHICLES

Specialist who designs structures (frame, lining, parts) made of composite materials with a preset weight, durability, wear resistance, etc. Composite materials are already used in different types of transport, while experts are actively looking for new applications. In particular, in autumn of 2014, the Composites Applications in Industry: Rail Sector Opportunities conference was held in Great Britain.

job to emerge before 2020  
to  
20 y.

CROSS-PROFESSIONAL SKILLS



# SMART ROAD BUILDER

Professional selecting and installing adaptive road surfaces, marking and road signs with radio frequency identification, surveillance systems, and road condition sensors.

job to emerge after 2020  
after  
20 y.

CROSS-PROFESSIONAL SKILLS



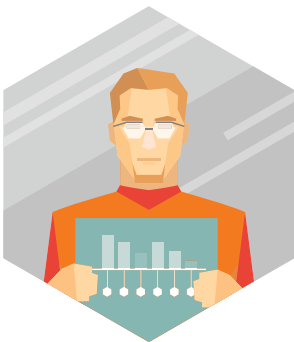


# AUTOMATED TRANSPORTATION SYSTEM OPERATOR

Manages the servicing of robotic transportations networks and configuration of computer software for robotic mechanisms and vehicles, primarily unmanned.

job to emerge after 2020  
after 20 y.

CROSS-PROFESSIONAL SKILLS



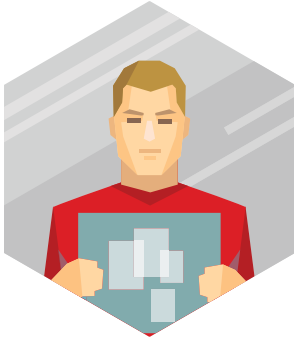
# TRANSPORTATION NETWORK SAFETY ENGINEER

Professional analyzing and monitoring information, environmental and technological threats to transportation networks. Unlike traffic safety experts, these engineers analyze and prevent problems connected with the functioning of whole transportation networks. With the increasing speed of data transmission, demand is growing for faster movement and higher speed of transportation, which means more stringent requirements for network infrastructure and safety.

job to emerge after 2020  
after 20 y.

CROSS-PROFESSIONAL SKILLS





# SMART MANAGEMENT SYSTEM ARCHITECT

Develops software for unmanned vehicles and traffic management systems; controls smart management systems. Various solutions exist today to monitor complex shipments, though shipments are managed by people. The future will require automated traffic management systems.



## SOCIAL DIARY

By letting the alarm snooze for 5 minutes, we put off breakfast. Good morning, everybody!

Guys, you should try the 3rd-level unmanned system! A wonderful view of the waking city. Beauty!

### 9:00 WORKDAY BEGINS

R-24 project (4th-level unmanned transit system): on the world's roads very soon!

Programmers, quick! I need help analyzing combined software modules.

Everything works OK, only with a code at the moment. Errors have been corrected. I'm satisfied. Time for lunch.

### 13:00 LUNCH BREAK

It's always fun in our restaurant, especially during rush hours!:) It's good they replaced waiters with robots!

### 14:00 BREAK ENDS

Everything's been put together; handing over the R-24 for testing.

A real world simulator is a compelling thing in itself, but seeing how new technologies are introduced is simply amazing!

Tomorrow I'm on duty in the smart management system control room. If anything is wrong with transport operation, write me!

The first testing phase went down completed perfectly! Great! Thanks to all team members!

### 18:00 WORKDAY ENDS

I'm waiting for everyone at our favourite place! Let's celebrate!!!

job  
to emerge  
after 2020



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Moscow State University of Railway Engineering (MIIT)
- Moscow State University of Technology STANKIN (MSTU Stankin) (Automated Design Systems department)
- Far Eastern State Transport University
- Moscow Automobile and Road Construction University
- Moscow State Institute of Electronics and Mathematics
- Siberian Federal University
- Kalashnikov Izhevsk State Technical University (Operation of Land Transport and Transport Equipment)



## ROAD TRANSPORT EMPLOYERS IN THE RUSSIAN FEDERATION

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### FORWARDING AND LOGISTICS COMPANIES AND ROAD OPERATION

- Russian Railways
- Russian Highways
- Mostotrest
- Freight One
- First Forwarding Company
- Federal Passenger Company
- Moscow Metro
- Avtoban Road construction company

### VEHICLE PRODUCERS

- SOLLERS
- AvtoVAZ Group
- GAZ Group
- KAMAZ
- Russian Machines
- Rolf Group
- Ford Motor Company
- Avtotor

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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Russian Railways is recognized as the largest employer in Russia, with multiple divisions and branches across the country. There are a great number of state-owned and private companies operating transportation systems. Vehicle production is dominated by international concerns, including those controlling popular Russian brands.





# WATER TRANSPORT

## HOW IS THE INDUSTRY CHANGING?

Water transport has been vital in Russian history, providing communication between different regions and rich trading opportunities (Volga trade route connected Scandinavia with the Arab caliphate, and the route from the Varangians to the Greeks connected it with Byzantium). Although in the past years the role of water transport reduced to a certain extent, it remains an important part of the transportation industry, especially in freight forwarding. If the intensive use of the Northern Sea Route (the shortest route

between Russia's European region and the Far East) is resumed, it will probably revitalize the industry, and the Russian water transport will regain its significant role in shipping between Europe and Asia.

A multimodal system is advancing in sea transportation (shipment of cargoes under a single contract, using different modes of transportation, e.g. by railway and sea). Intelligent management systems are applied, along with the introduction of new fuels and advanced materials.

## MOST POPULAR ADVANCED TECHNOLOGIES OF THE COMING YEARS:

- Intelligent systems for water transport management (ships and port infrastructure)
- Green ships and ports having minimal impact on the environment owing to the use of ecofuels and advanced waste treatment)
- Materials drastically reducing water resistance during vessel movement and enhancing water infrastructure stability (ports, platforms)

## POSSIBLE FUTURE CHALLENGES

- Design of intelligent water transport management systems
- Design of intelligent port infrastructures
- Arctic navigation
- Environmental protection of port waters
- Design of port infrastructure and vessels using advanced materials

### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



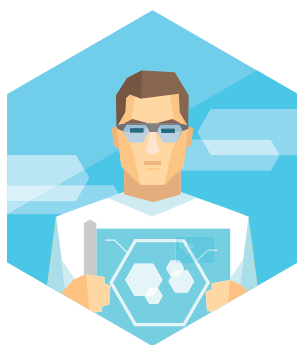
Lean production



Artistic skills



Environmental thinking

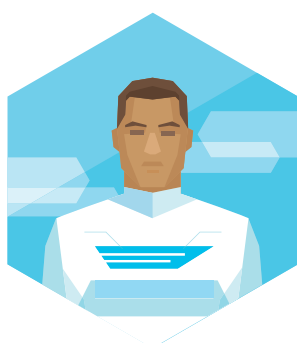


## PORT ECOLOGIST

Specialist monitoring and controlling the environmental characteristics of the port, vessels and the surrounding space (port waters, air and adjacent territories, with all the plants and animals inhabiting them). Develops software to restore the environment of the port and surrounding waters. Western universities are already deploying their own education programmes on port water systems (e.g. the ecosystem of Boston Harbour is described in detail on the University of Massachusetts website).



### CROSS-PROFESSIONAL SKILLS



## MARINE INFRASTRUCTURE SYSTEM ENGINEER

Professional who develops and implements technologies to increase the resilience of shoreline structures and vessels to different threats (natural, anthropogenic). Training in the specialty is already provided (System Technology of Marine Infrastructure), although a significant upgrade of technologies (in particular, increased environmental requirements and intelligent water transport management systems) will change job requirements.



### CROSS-PROFESSIONAL SKILLS





# ARCTIC NAVIGATION SPECIALIST

Familiar with ice navigation in the Extreme North, able to plot the best course for a ship and make quick decisions to change them in case of emergency.



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Admiral Makarov State University of Maritime and Inland Shipping
- Admiral Ushakov Maritime State University
- Far Eastern Federal University (Hydrotechnical Construction)
- Peter the Great Saint Petersburg Polytechnic University (Hydrotechnical Construction)
- Saint Petersburg State Maritime Technical University
- Admiral Nevelskoy Maritime State University (MSUN)

## WATER TRANSPORT EMPLOYERS IN THE RUSSIAN FEDERATION

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### TRANSPORT AND LOGISTICS COMPANIES

- ROSMORPORT
- Sovcomflot (SCF)
- Atomflot
- Sea and River Shipping Group
- Morcenter TFC

### VESSEL PRODUCTION:

- United Shipbuilding Corporation, comprising over 60 major shipbuilding firms and vessel equipment producers, including:
  - Sevmash (Northern Machine Building Company)
  - Admiralty Shipyards
  - Vimpel



KIAS 2

105  
100  
99  
95  
65

ALT 2

10 500  
10 250  
10 000

220 KTS  
+440 FT  
9488 FT

222 KTS  
+244 FT  
9488 FT

223 KTS  
+340 FT  
9488 FT

TAS 90  
GS 91  
4.50  
1200 Mode 4  
CLK (GMT)  
15:35:25

CH01 118.325 29.92  
POWERUP  
04:23:15



# AVIATION

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## Svetlana Kraichinskaya

Vice President of Human Resources, United Aircraft Corporation

I like the Atlas because it provides a selection of potential specialties for our students thinking about their future jobs. It would be great if this selection were consistent not only with global development trends of specific industries, but also with development strategies of particular Russian companies. This is why I believe that the objective at the next step in the Atlas evolution is to link rather general professions to potential practical areas where they will develop and take on a specific meaning.

## HOW IS THE INDUSTRY CHANGING?

Aircraft can quickly carry people and cargoes to enormous distances and reach areas inaccessible for road transport, which is invaluable in the case of Russia's vast distances. Historically, our country used to be one of the leaders in aircraft construction and air transportation, but lost this status. However, the sector has been recovering lately, including segments of small aircraft systems, regional airports, etc. Substantial technological breakthroughs are expected in the area, which will have ever-increasing importance in the future.

Air transportation will become more affordable and diverse. General aviation is developing fast, and within 10 to 15 years, aircraft may appear that will be cost comparable in price to automobiles. In 2012, the Finnish aircraft engineer Aki Suokas presented a prototype of the 70 kg single seat aircraft FlyNano, able to rise to 3,000 meters, moving at a speed of 140 km/h. The device is not for sale yet, but can be pre-ordered for EUR35,000.

In addition, unmanned aviation will also progress rapidly. Cities will use unmanned aircraft to deliver cargoes, for construction, or to monitor traffic and security. For example, the Massachusetts Institute of Technology has created the SkyCall quadcopter to help people find their way in unknown locations. Whenever lost, you can use your smartphone to ask the drone for assistance. Russia has been the first country to use quadcopters for pizza delivery, with the company Copter Express offering the service to its clients.

The airship segment will also gain a second life, with new airships using advanced technology, which will be used in hard-to-reach areas (e.g. to extinguish forest fires and deliver cargoes). Intensifying air traffic will require new and improved ground control systems. This will impose new requirements on infrastructure construction and intelligent control support systems.

The aircraft construction industry is undergoing changes as well. First of all, the












application of composite materials allows manufacturers to reduce the weight and increase the durability of aircraft. For example, half of the Boeing 787 Dreamliner is made of composites. Other important factors will be

the advance of intelligent control systems (in particular for large craft, such as cargo planes), active threat protection systems, as well as the use of biofuels and transition to electric engines

**POSSIBLE FUTURE CHALLENGES**

- Development of unmanned aircraft control interfaces
- Design and development of small aircraft
- Piloting of small aircraft
- Automation of ground control systems
- Aircraft recycling

CROSS-PROFESSIONAL SKILLS

 Systems thinking	 Intersectoral communication	 Project management	 Programming / Robotics / Artificial Intelligence
 Client focus	 Multilingual and multicultural abilities	 Interpersonal skills	 Ability to work under uncertainty
 Lean production	 Artistic skills	 Environmental thinking	



# SMALL AIRCRAFT PRODUCTION ENGINEER

Specialist designing and modelling affordable aircraft of various complexity for general aviation. Appropriate engineers are already available, but the growth of general aviation (e.g. in the Far East) is predicted to raise demand for them.



CROSS-PROFESSIONAL SKILLS

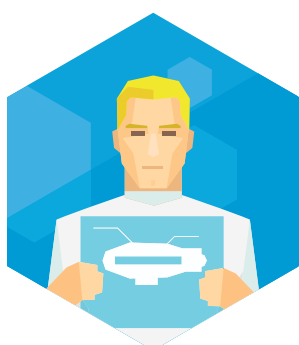


# OPERATING DATA ANALYST

Professional in processing data and preparing expert opinions based on the monitoring of the aircraft and surrounding area.



CROSS-PROFESSIONAL SKILLS



# AIRSHIP DESIGNER

Specialist tasked with designing airship models according to their applications (cargo/passenger) and aeronautical conditions.



CROSS-PROFESSIONAL SKILLS





# UNMANNED FLIGHT INTERFACE DESIGNER

Professional who designs interfaces and software packages for unmanned aircraft control; responsible for programming and operating the support, navigation and safety systems of unmanned aircraft.



## CHAT BETWEEN UNMANNED AIRCRAFT INTERFACE DESIGNERS

- 13:56 FIREFLY:**  
It seems we're in for a bad day, guys. Just got a call from Amazon's drone courier service: they've had three coordinate incidents already. Missing by 200-300 km isn't funny. I suggest someone go to their control centre and sort this out.
- 13:58 ROYBATTY:**  
I can go.
- 14:02 KIRK:**  
Can it be a virus?
- 14:03 FIREFLY:**  
Doesn't look like one. We got them the latest antivirus software just two days ago. My bet is on a glitch in the control system.
- 14:13 STARBUCK:**  
btw, what about the hacking and reprogramming protection system? has it launched yet?
- 14:18 KIRK:**  
we sent a drone with the beta version to the hackathon in Barcelona the day before yesterday. Promised a big reward to those who can break it. No one has had luck so far, but it still has two more days left. We'll wait and see.

job  
to emerge  
after 2020



## CROSS-PROFESSIONAL SKILLS



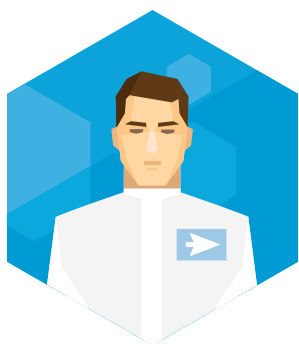


# AIRCRAFT RECYCLING TECHNOLOGIST

Specialist in the development of recycling procedures for basic materials, equipment and aircraft framework components. The job already exists. There is the Aircraft Fleet Recycling Association, which includes major producers (such as Boeing, Bombardier), engine producers (Pratt&Wittney, Rolls-Royce), recycling companies, and many others.



CROSS-PROFESSIONAL SKILLS



# AIRSHIP INFRASTRUCTURE DESIGNER

Specialist designing airfields, hangars, maintenance depots and navigation infrastructure components for airships. Airships can be used to deliver cargoes and passengers to places that are hard to reach due to poor transport infrastructure. For example, the Russian-based Amur Minerals Corporation is considering a possibility of heavy equipment delivery by airships to a road construction site. The road will cost around \$150 million.



CROSS-PROFESSIONAL SKILLS





# DYNAMIC CONTROL SMART MANAGEMENT SYSTEM DESIGNER

Professional in designing software for air traffic control over traffic-intensive cities and regions (in case of a significant growth of unmanned and general aviation, with sharply increased loads on the airspace and a shift toward flexible traffic management).



CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- A.N. Tupol'ev Kazan National Research Technical University
- Moscow Aviation Institute (National Research University) (MAI)
- Ulyanovsk State Technical University (UISTU) (Aircraft Construction)
- Military Aviation Engineering University (Voronezh)
- Siberian State Aerospace University (SibSAU)

## AIR TRANSPORT EMPLOYERS IN THE RUSSIAN FEDERATION

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### AIRCRAFT CONSTRUCTION

- United Aircraft Corporation, including:
  - Sukhoi
  - Tupolev
  - Russian Aircraft Corporation MiG
  - Irkut Corporation
  - and others.
- United Industrial Corporation Oboronprom, including:
  - Russian Helicopters
  - United Engine Corporation
  - Kamov
  - Klimov
  - and others.
- Aviapribor-Holding
- ZALA AERO GROUP Drones

### FORWARDING AND LOGISTICS COMPANIES

- Aeroflot
- Transaero
- S7
- Sheremetyevo Airport
- Domodedovo Airport
- Pulkovo Airport
- Koltsovo Airport



## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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Nearly all industrial enterprises in the industry are part of two major corporations, UAC and United Industrial Corporation Oboronprom. Small and medium businesses of Russian Helicopters are engaged in helicopter construction, testing, and maintenance. Small, private companies develop simple components for aircraft systems and outfit the aircraft interiors. The drone sector is still in the early stages of development.



# SPACE

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## HOW IS THE INDUSTRY CHANGING?

In spite of the general fascination with Star Wars and the dreams of inhabiting distant planets, the popularity of the space sector has been declining over the past decade, which is quite logical, since there have been no significant breakthroughs in the area, and with enough urgent problems on Earth. However, the sector is now at a turning point due to the first successes of the private space sector. From a terra incognita open only to intrepid pioneers, space is gradually turning into a commercial sector, which is opening broad opportunities for creating private businesses, e.g. providing support for satellite launches and probes.

Private rocket launches are already cheaper than for traditional rockets. Investors from Silicon Valley are seriously discussing the prospects of Mars colonization. In 2013, they started a global screening of astronauts for a colonization mission to Mars, named Mars One. The screening will continue until 2015. In 2023, after a long training course and a whole year en route, the first crew of four is expected to land on the Red Planet. A new group will arrive every two years and the population of the colony should increase to 20 people by 2035. NASA, together with DARPA, is going to send a manned ship to other star systems within the next century.

The sector intensively uses paperless workflow, building complete digital models of items with all the connections between their components. Digital modelling of behaviour of a whole aircraft is performed in various conditions, as well as interaction between its components under various exposures. An increasingly greater number of components and aggregates are produced without human involvement.

Within the next 20 years, space tourism may become one of the most promising branches of the space industry. In 2007, Virgin Galactic started selling tickets to its SpaceShip Two, a private travel ship, which can fly at altitudes of over 100 km. The programme has not started yet, but should be launched in the near future.

Space may also help industry on Earth, as it can be used for toxic waste disposal, production of high-quality crystals in zero gravity, and mineral resource extraction from the Moon and asteroids. Astrophysical studies show that comets and asteroids are rich in iron, gold, nickel, platinum and other precious metals.

The space conquest opportunities will grow considerably if we succeed in creating affordable technologies to deliver cargoes and people to the orbit, e.g. build a "space elevator" from the Earth surface.

## POSSIBLE FUTURE CHALLENGES

- Design and management of space structure life cycles
- Space structure repairs
- Researching biological systems in space
- Studying the influence of man on space, space objects, and Earth atmosphere
- Exploration and mining of mineral resources on other planets and asteroids
- Design and management of near-Earth transportation network
- Development of space travel programmes and space structures
- Manufacturing of products and materials in space

### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



Lean production



Artistic skills



Environmental thinking



# SPACE STRUCTURE LIFE CYCLE DESIGNER

Specialist in designing space structures (stations, satellites, etc.) based on reconstruction and disposal needs. Demand for the profession will arise in the coming years, in connection with more intensive exploitation of near-Earth space and resumption of plans to colonize the Moon and Mars.

job  
to emerge  
before 2020

to  
20 y.

CROSS-PROFESSIONAL SKILLS



# SPACE TRAVEL MANAGER

Professional developing visiting programmes for near-Earth space (and beyond), orbital complexes, and other space structures (including Moon bases).

job  
to emerge  
after 2020

after  
20 y.

CROSS-PROFESSIONAL SKILLS





# SPACE BIOLOGIST

This specialist studies the behaviour of various biological systems (from viruses to animals and humans) in space (structures, spacecraft, planet bases); studies the physiology and genetic changes of organisms; develops stable space ecosystems for orbital stations, Moon bases and lengthy journeys.



## LETTER FROM A MARS STATION

To: Mom [levina.f@supermail.ru]

From: Me [anna.s@biostation.mrs]

Subj: re: Congratulations!

Dear Mom and Dad Thanks for the congratulations! Strange thing: it's been a year since we landed on Mars but it still feels like I arrived just recently.

The lab is doing well, although the mice that I infected with the flu are still showing very low resistance and I can't figure out why.

But there is good news as well. We've had a hard time adapting the bacteria and germs we brought from Earth to Mars conditions. However, we seem to have succeeded in growing stable microorganism colonies in an artificial lake not far from the base. I'm also waiting for new samples from the glaciers. There may be something interesting there.

Our next video broadcast is airing soon. Follow updates on the website.

Say hello to Sis!

Yours,  
Ann

job  
to emerge  
after 2020



## CROSS-PROFESSIONAL SKILLS



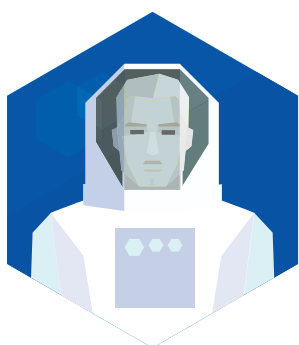


# LIFE SUPPORT SYSTEM ENGINEER

Maintains life support systems in extreme conditions.



## CROSS-PROFESSIONAL SKILLS

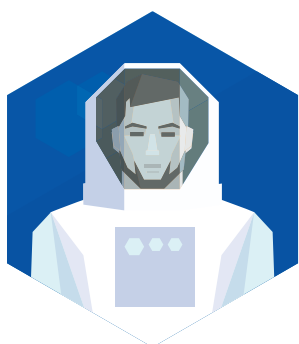


# SPACE GEOLOGIST

Specialist engaged in exploring and mining mineral resources on the Moon and asteroids.



## CROSS-PROFESSIONAL SKILLS



# SPACE ROAD ENGINEER

Professional services the near-Earth transportation network and is responsible for designing traffic corridors (orbital flights as well as transcontinental flights along ballistic trajectories) and synchronizing launches on Earth (in case of more frequent launches and a manifold increase in the number of orbital objects).



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Moscow Aviation Institute (National Research University) (MAI)
- A.K. Serov Krasnodar Military Flight School (Military Institute)(Department of Aircraft Operation and Air Traffic Management)
- N.E. Bauman Moscow State Technical University (BMSTU)
- Siberian State Aerospace University (SibSAU)
- Saint Petersburg State University of Aerospace Instrumentation (SUAI)



## SPACE TECHNOLOGY EMPLOYERS IN RUSSIAN FEDERATION

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- Russian Federal Space Agency Roscosmos, including:
- S.P. Korolev Rocket and Space Corporation Energia
- Rocket and Space Center Progress
- M.F. Reshetnev Information Satellite Systems
- Khrunichev State Research and Production Space Center
- S. A. Lavochkin Research and Production Association

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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Future professionals in the sector should bear in mind that all research, industrial and testing companies of the industry are state-owned, while private companies are represented only with small and medium businesses specializing in service subcontracts. However, within the coming 10 to 15 years, the private market will develop to potentially create a new space industry.



# MINING AND PROCESSING OF MINERAL RESOURCES

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## HOW IS THE INDUSTRY CHANGING?

Russia is one of the richest countries in terms of mineral resources. That is why their extraction and processing are of great significance for our economy. Demand for mineral resources will remain quite high in the coming decades, which is why these industries will continue needing highly qualified staff. A few factors play key parts at the current stage.

First, traditional deposits of oil, gas and other resources are depleting, and production companies are forced to develop increasingly more complex fields as well as new types of resources, such as oil-bearing sand, shale gas, and offshore and deepwater fields. Deepwater drilling will be needed not only in the oil and gas industry but also for industrial mining of manganiferous iron ore and other metals.

Second, environmental requirements are increasing in the field of transporting mineral resources and field conservation. An example of an advanced and environmentally safe technology used now is the collection of methane emitted during mineral resource extraction into the pipeline to prevent gas emissions into the atmosphere. Biotechnological solutions are emerging in

the industry as well, e.g. ore refining using bacteria.

Another important trend is the attempt at production cost reduction and resource efficiency. For example, methane from coalmines can be liquefied to be used as fuel. This technology will be applied primarily for production needs, e.g. to fuel dump trucks and illuminate structures, and it is especially useful at deposits with harsh climatic conditions, where shift or unmanned work methods are used.

Third, staff mobility in the sector will grow. Already, increasingly fewer specialists are prepared to move with production activities. Therefore, unmanned technologies will be used more often, with employees working remotely in virtual teams and telemetric systems. Some industries will develop with minimal numbers of staff, which will be replaced with intensive use of technology (e.g. remote healthcare). Only experts will work in shifts at such facilities.

Extraction and processing of mineral resources is a high-risk industry, which is why technologies are being developed to ensure the safety of people at production sites.

**POSSIBLE FUTURE CHALLENGES:**

- Design, development and maintenance of automated extraction systems
- 4D modelling of the life cycle of fields, from exploration to conservation and rehabilitation
- Analysis and forecasting of environmental threats arising in the operation of mineral resource deposits
- Design and development of automated systems for environmental monitoring

CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



Lean production



Artistic skills



Environmental thinking



# MINING SYSTEM ENGINEER

Specialist working at natural resource facilities throughout their life cycle (from exploration to field conservation and rehabilitation), taking into account the integrated nature of these facilities. For example, one site may contain both oil and gas fields, with a need to seamlessly combine these absolutely different extraction technologies.



## CROSS-PROFESSIONAL SKILLS



# ENVIRONMENTAL ANALYST IN MINING INDUSTRIES

Specialist in environmental threat analysis, environment protection during resource extraction and recovery activities in a given territory in the closing stages of resource extraction.



## CROSS-PROFESSIONAL SKILLS



# TELEMETRIC DATA INTERPRETATION ENGINEER

Specialist engaged in analyzing arrays of data arriving from the field to control the production process, prevent possible emergencies and make quick decisions. It is highly probable that after 2020 the job will be replaced with artificial intelligence.



## CROSS-PROFESSIONAL SKILLS





# ROBOTIC SYSTEM ENGINEER

Services and manages automated systems for monitoring, development, production and processing of mineral resources (including remote ones). The specialty is already in demand in Russia, with 98 vacancies published in July 2014, according to HeadHunter.



## LETTER FROM A ROBOTIC SYSTEM ENGINEER

To: Masha [*maria-2013@futuremail.net*]

From: Me [*alex@robosys.com*]

Subj: *re: Поздравляем!*

Masha, hi, I'm still at the Urengoy gas field. The flight to the next site is in a week and a half. The job is difficult but exciting; it's hard to imagine that people used to do all the work that machines are doing now.

I've read the old safety rules: accidents were not frequent but a certain degree of risk was present anyway, let alone the fact that crews used to live at the field for a few months, with food and household items brought to them. I think life has gotten better after all.

Going to sleep soon – had a hard day. Will send you the photos later. How's Seryozha? Has he done well with the test? Tell him I said hello.

Yours,  
Sasha

job  
to emerge  
before 2020



## CROSS-PROFESSIONAL SKILLS





# UNMANNED EXPLORATION AIRCRAFT OPERATOR

Professional who controls the process of field development and exploration of new fields using unmanned aircraft equipped with magnetometers and other geophysical sensors. Such drones are already used on the Yukon plateau in Canada to explore new fields.



## CROSS-PROFESSIONAL SKILLS



# DISTRIBUTED MINING TEAM COORDINATOR

Specialist ensuring coordinated interaction between people located at the site and remote team members. His main task is to set tactical goals, arrange communication amongst the team, and resolve differences and conflicts.



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Gubkin Russian State University of Oil and Gas
- Far Eastern Federal University (FEFU)
- National Mineral Resource University (University of Mines)
- Siberian Federal University
- Sergo Ordzhonikidze Russian State Geological Prospecting University (MGRI-RSGPU)
- Urals Federal University named after the first President of Russia B.N. Yeltsin
- North-Eastern Federal University in Yakutsk



## MINERAL RESOURCES EXTRACTION AND PROCESSING EMPLOYERS IN RUSSIAN FEDERATION

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### OIL AND GAS COMPANIES

- GAZPROM
- Gazpromneft
- LUKoil
- ROSNEFT
- TNK-BP Holding
- Surgutneftegaz
- NOVATEK

### METALMAKING / MINING COMPANIES

- Siberian Coal Energy Company (SUEK)
- RUSAL
- EVRAZ Group
- Mechel
- SIBUR Holding
- Severstal
- Norilsk Nickel
- Novolipetsk Steel (NLMK)
- Urals Mining and Metallurgical Company (UMMC)
- ALROSA
- ARMZ

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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The extraction sector is the biggest in our economy, with its products taking up a greater share of the Russian industry. This sector is represented mostly by major private and state-owned companies, a number of which are the largest in the world in their respective segments, having branches in other countries. Small and medium businesses are most often parts of larger companies.



# METALLURGY

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## Tatiana Kozhevnikova

Director for Organizational Development, Chelpipe (Chelyabinsk Pipe Plant)

Why is the Atlas useful for us? The Chelyabinsk Pipe Plant is actively involved in career guidance for high school students, and if new metallurgical specialties appear in the Atlas as it develops, we will be able to interest children in those specialties. They will be able to see metallurgy not as something from the past but as an exciting future. They may become fascinated with physics and mathematics and later obtain a degree in metallurgy. We regard the Atlas as a means of promotion, to distinguish metallurgy as a decent career choice.

## HOW IS THE INDUSTRY CHANGING?

Metallurgy is one of the key branches in Russia, with strong traditions and high inertia. Growing global competition in the sector will lead to dramatic changes driven by a turn toward environmentally safer production processes, equipment replacement, and technological process quality. Industry standards will gradually shift in the direction of “white” metallurgy, the principles of which are already being introduced at the Chelyabinsk Pipe Plant.

Production processes will more often use methods ensuring minimal environmental impact, which, in some cases, will enable a transition from two-stage metal production (processing, smelting) to a one-stage process (extracting metal directly from the ore). Metal production waste will be directed to other production lines (primarily acids, alkali, and sulfur).

The sizes of metal-making facilities will change as well. Instead of huge complexes,

medium-sized facilities will be constructed, with higher flexibility and improved quality control. Mobile facilities will appear that will produce special metals, moving to wherever metal demand is high, e.g. major construction sites.

Customers will also review their requirements for metal products. In particular, the need to reduce the weight of a structure while preserving its strength is reducing demand for traditional products in the sector, such as sheet metal, pipes, bars, slabs, etc. They are being replaced with advanced materials such as plastics and composites, including, carbon fibre, metal composites, metal ceramics, etc.).

On the other hand, we will see a growth in demand for new products, such as nanopowders and complex alloys. The share of biometallurgy (extracting metals from low-grade ore using microorganisms, bringing

about substantial cost reductions) will grow. Precision alloy (metals with preset properties, such as elasticity, fusibility, conductivity, etc.) production will expand.

Production processes will become more automated and robotized. Some blue-collar jobs in metallurgy (there are over 500 of

them now) will decline (become endangered), giving way to versatile equipment operators. At the same time, workers will perform increasingly fewer physical operations, eventually switching to remote process control (sometimes even without being present at the facility).

### POSSIBLE FUTURE CHALLENGES:

- Development and management of automated production lines
- Mobile production management
- Design of alloys with preset parameters
- Environmental compliance control
- Metal product cycle management

#### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



Lean production



Artistic skills



Environmental thinking



# EQUIPMENT SUPERVISOR

Specialist with competences in mechatronics and engineering, operating and servicing high-tech equipment throughout its life cycle.

job to emerge before 2020

to  
20 y.

CROSS-PROFESSIONAL SKILLS



# ECORECYCLER IN METALLURGY

Professional tasked with metallurgic waste disposal and environment rehabilitation.

job to emerge before 2020

to  
20 y.

CROSS-PROFESSIONAL SKILLS



# ADVANCED METALS ENGINEER

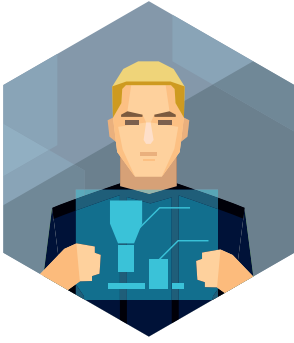
Specialist engaged in designing alloys with preset or variable properties (changing based on operating conditions).

job to emerge after 2020

after  
20 y.

CROSS-PROFESSIONAL SKILLS





# EQUIPMENT DESIGNER IN POWDER METALLURGY

Engineers advanced equipment for producing metals with a high degree of readiness (powders, alloys), using processes at the intersection of different sciences (biometallurgy, etc.).



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

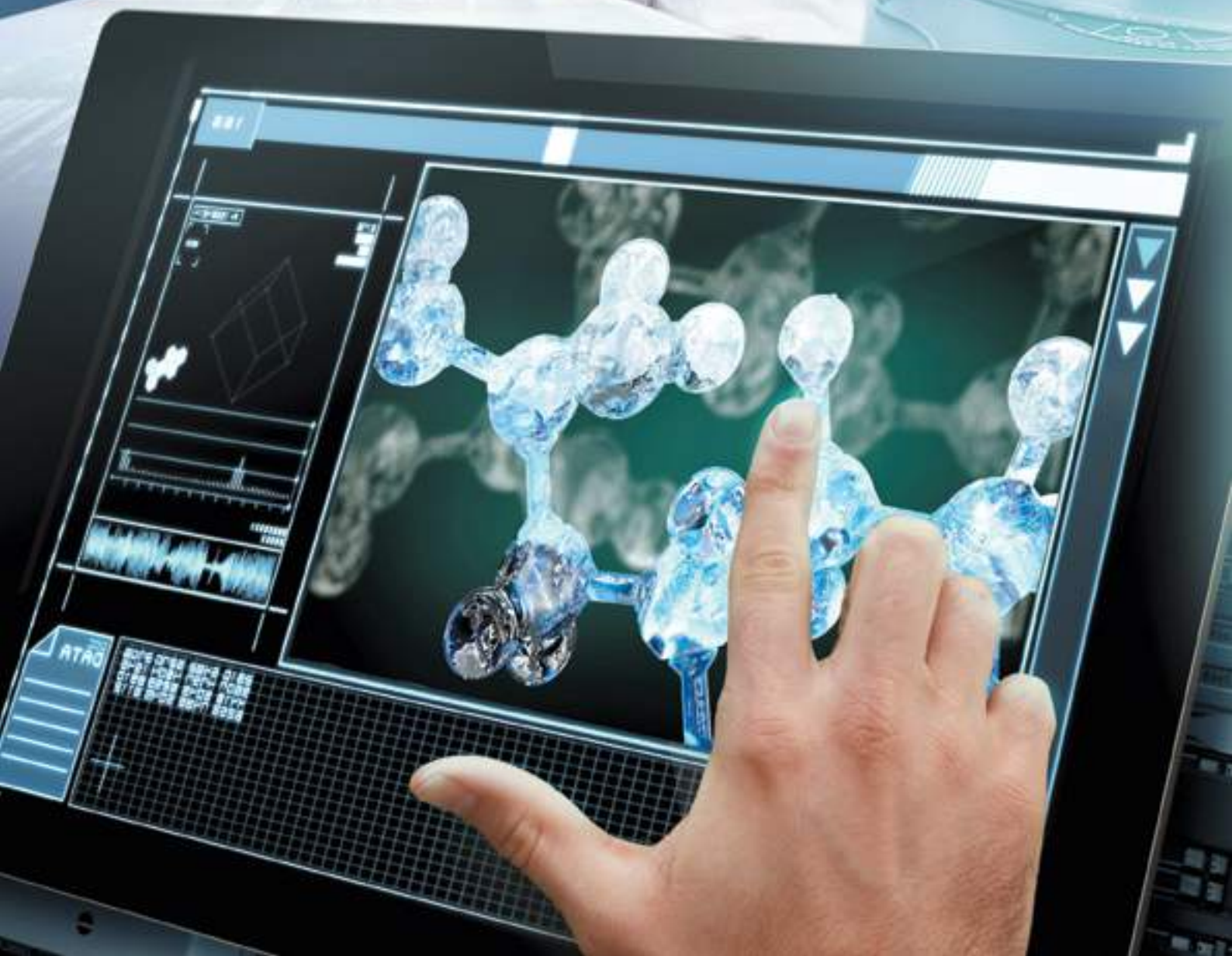
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- National University of Science and Technology (MISiS)
- Russian State Technological University (MATI)
- Moscow State University of Mechanical Engineering (MAMI)
- National Mineral Resource University (University of Mines)
- National Research South Ural State University (Faculty of Physics and Metallurgy)
- North Caucasian Mining and Metals Institute
- Lipetsk State Technical University
- Pervouralsk Metals College

## ADVANCED AND NANOTECHNOLOGY EMPLOYERS IN THE RUSSIAN FEDERATION

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- EVRAZ
- New Lipetsk Steel Works
- Severstal
- TMK Group
- Chelpipe (Chelyabinsk Pipe Plant)
- Norilsk Nickel
- RUSAL
- Urals Mining and Metallurgical Company (UMMC)
- VSMPO-AVISMA





# ADVANCED MATERIALS AND NANOTECHNOLOGY

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## Leonid Malamed

CEO, Composite Holding Company, member of the Coordination Council, Moscow School of Management, Skolkovo

We are living in an amazing time, when we can watch the true nature of man. Out of all people, only 10% are prepared to sacrifice absolutely everything for their career. A person can be successful in any job. The trick is to find the one that truly inflames you. When pursuing your professional aims, improving, and striving for success, one shouldn't worry about money. It will always come to those who are sincerely fascinated with their job.

## HOW IS THE INDUSTRY CHANGING?

Technological progress is almost palpable now, as we are not only using traditional materials more efficiently, but are also creating new ones, with preset parameters. This allows a dramatic improvement of product quality, mainly in the aerospace industry, mechanical engineering, and construction.

Material science has been revolutionized by composite materials, or compound heterogeneous materials consisting of a reinforcing component and a matrix and offering improved strength, weight and plasticity. Composites will pose a serious threat to traditional material branches, such as ferrous metallurgy.

In addition to plastic and metal-based composites, which we have grown accustomed to, glass-based composites are also gaining popularity. In the future, composite structures can be embedded with "smart components" (microchips and controllers) allowing the user to change the properties of rooms and equipment to their liking. This will lead to the emergence

of active environments, i.e. working, living and studying areas controlled by intelligent systems or the user, depending on the mood or the task at hand. For example, for a yoga session, you can select a more neutral color for the walls; for child's play, make the walls softer and soften out the corners; for a party, you can cool down the room and turn on embedded bright backlights. Smart rooms can adapt to various weather conditions by adjusting temperature and light intensity.

Another most significant invention is 3D printing, i.e. the use of special compounds to reproduce any object, whether a computer circuit board, musical instrument, weapon, or prosthesis. The technology can be applied, among others, in the transport industry. For example, at the International Manufacturing Technology Show in Chicago in September 2014, the U.S.-based Local Motors invited visitors to see the creation of Strati, the first, functioning car ever produced with a 3D printer. The process took 44 hours to complete. Although the electric engine, seats,

wheels, tires and the windshield had to be manufactured by traditional methods, 3D printing drastically reduced the number of parts and time of assembly. According to the company's CEO John Rogers, very soon, two people will be able to assemble a complete car in less than an hour.

New discoveries in this field are leading to improvements in the properties and durability of materials, mechanisms, and structures. The

emergence and development of 3D printing has marked a new era in manufacturing, as end products can now be actually home-made, rather than manufactured by special factories, which means that every consumer can become a producer. Home printers grow cheaper every day. The most affordable ones are already priced at \$500, with enthusiasts uploading more and more drawings to print all kinds of things.

### WHAT TO EXPECT IN THE COMING YEARS:

- Transition from module-based production to making the entire product using a 3D printer;
- All-round replacement of traditional materials (e.g. steel) with composites in construction and mechanical engineering;
- Programming material properties (including the emergence of materials adaptive to weather conditions).

### POSSIBLE FUTURE CHALLENGES:

- Designing advanced materials with preset properties
- Modelling equipment, processes, and facilities; forecasting life cycles using 3D and 4D models
- Replacement of traditional materials with composites in various industries
- Development, production and application of smart materials able to react to various tasks or independently analyze the condition of the environment or user in order to perform a transformation needed to solve a problem
- Ensuring safety in the production and application of advanced materials

#### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



Lean production



Artistic skills



Environmental thinking



# SYSTEM ENGINEER OF COMPOSITE MATERIALS

Specialist who replaces traditional materials with composites in construction, mechanical engineering, robotics, medicine, etc. This professional will design advanced materials depending on the requirements of consumer industries regarding frost resistance, fragility, durability, hypoallergenic properties, etc.



## CROSS-PROFESSIONAL SKILLS



# NANOMATERIAL DESIGNER

Professional engaged in modelling the properties and forecasting the life cycle of nanomaterials with the use of digital models. This designer is a highly qualified programmer with a good knowledge of nanophysics and nanochemistry.



## CROSS-PROFESSIONAL SKILLS





# RECYCLING TECHNOLOGIST

Specialist engaged in developing and implementing recycling technologies, creating new materials from industrial waste, and developing waste-free production processes. Russia is only beginning to master the technologies of lean and sustainable production actively used in the West. For example, young designer Victor Monserrate invented the recycling bicycle, a machine that turns plastic waste into a thread that can be used to produce furniture. New Zealander Daniel McLaughlin found out that rug producers wasted about 7% of wool, and launched a “biowool” production line using wool waste and biorubber as raw materials.



CROSS-PROFESSIONAL SKILLS



# GLASS ENGINEER

This specialist develops glass products using glass-based composite materials.



CROSS-PROFESSIONAL SKILLS





# SMART MATERIAL DESIGNER

Professional responsible for designing composite materials within smart environments, which change their properties according to given tasks in a home, office, or industrial facility.



## SMART ENVIRONMENT DESIGNERS' CHATROOM

- 13:56 PINKY:**  
Lena, we have a new order. We need to design an environment for a new school
- 13:58 BRAIN:**  
Great! What exactly do they want?
- 14:02 PINKY:**  
First, a flexible gym, with temperature and floor hardness adjusted depending on the activity – from yoga to basketball. Second, creative classes that need touch-triggered walls that change color, so that the children can draw with their hands
- 14:03 BRAIN:**  
OK, send me the drawings and inputs, and I'll come up with a few options by the end of the week
- 14:13 PINKY:**  
OK. Almost forgot: they also want a relaxation room that would scan brain activity parameters, transmitted from neural gadgets, and adjust according to the student's mood
- 14:18 BRAIN:**  
This one is harder, but I'll ask Tom: he did something like that for the Yale University. I don't think he would mind advising

job  
to emerge  
after 2020



## CROSS-PROFESSIONAL SKILLS





# SAFETY ENGINEER IN THE NANO INDUSTRY

Specialist in charge of the safety of workers in the industry, end product users, and the environment. Develops programmes enabling a quick reaction to the negative impact of production and application of nanoproducts.

job  
to emerge  
after 2020

after  
20 y.

CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Moscow Institute of Physics and Technology (MIPT)
- National University of Science and Technology (MISiS)
- D. I. Mendeleev University of Chemical Technology of Russia (MUCTR)
- Tomsk Polytechnic University (TPU)
- Moscow State University of Fine Chemical Technologies (MITHT)
- Peter the Great Saint Petersburg Polytechnic University
- N. I. Lobachevsky State University of Nizhny Novgorod (UNN)
- Urals Federal University named after the first President of Russia B.N. Yeltsin

## ADVANCED MATERIALS AND NANOTECHNOLOGY EMPLOYERS IN THE RUSSIAN FEDERATION

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- Ruscomposit
- RT-Chemical Technologies and Composite Materials
- Composite Holding Company
- NT-MDT
- RUSNANO project companies



## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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There are many small and medium companies engaged in nanomaterial production in Russia.

There is also a certain number of companies producing 3D printers, in particular, PICASO 3D and RGT and the demand for their solutions suggests that the sector will progress in the coming years.



# ROBOTICS AND MECHANICAL ENGINEERING

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**Dmitry Kaisin**

Deputy Director General, Federal Center for Promotion of Industrial Growth

In three to five years the term “blue-collar job” will take on a much broader meaning. It will include activities associated with not only manual labour or tool usage. New blue-collar jobs will emerge in engineering, industrial design, and other creative areas. Thinking about those jobs now will help us timely identify requirements and prepare for the mass emergence of new competences in the labour market.

## HOW IS THE INDUSTRY CHANGING?

The ideas that had for long seemed to belong to science fiction may materialize in the near future, as robot manufacturing techniques have grown substantially cheaper, arousing great interest in intelligent machines. According to a study by Cisco, the number of household robots in cities doubles every nine months. In the 2020s, robots will blend with the interior of residential flats and urban areas.

Models have been created that can look after elderly people (give out medication, contact the doctor, send an SMS for an ambulance if the person suddenly falls down), assist in cooking, clean up after pets, and even fetch beer from the fridge.

Furniture and household appliances are evolving as well, with smart tables, mobile wardrobes and robotic baby strollers appearing in addition to the already popular vacuum-cleaning robot. All this makes household robotics likely to become one

of the fastest-growing branches of the economy.

Industry (mechanical engineering in particular) is actively introducing new-generation robotic systems with sufficient flexibility to adjust to incoming tasks and learn in the process. Soon mechanical engineering enterprises will work according to the principle of robots making robots. Developed countries, with Russia following just behind, are building factories that are 90% automated and higher. High-tech equipment at mechanical engineering factories will become more module-based and distributed, ensuring fast assembly of new production lines. Workers at such factories will be promptly grouped and re-grouped into highly effective teams consisting of people with required knowledge and skills, able to quickly perform specific production tasks.

Robots will play a vital part in medicine. Systems are being developed to assist in

complex surgeries, while robotic prostheses will allow disabled people to live full and rich lives.

Will robots take our jobs? Experts predict that machines will replace people in routine

(repetitive) jobs, nudging them into creative fields (see Endangered Jobssection). Wherever there is a need for creativity, in-depth analysis or communication abilities, man is still unrivaled.

### POSSIBLE FUTURE CHALLENGES:

- ◆ Designing robots and robotic systems for various fields:
  - Medicine
  - Industry
  - Households
  - Children
- ◆ Designing and selecting materials for robotic device components
- ◆ Designing robotic systems based on the need of their interaction with people and the environment
- ◆ Designing learning systems for robots
- ◆ Designing and controlling highly complex robotic systems

#### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



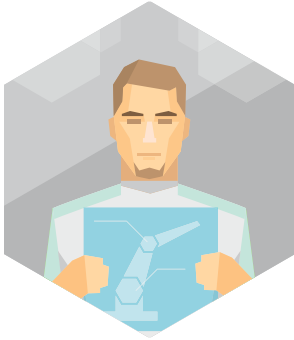
Lean production



Artistic skills



Environmental thinking

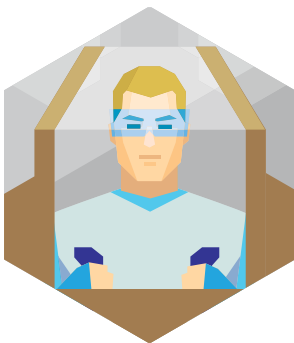


# INDUSTRIAL ROBOT DESIGNER

Specialist designing robotic devices for manufacturing (for painting, welding, packing and stamping jobs), industrial logistic devices, e.g. loaders, transporters, manipulators, and robotic systems consisting of those devices, such as “lights-out” factories. Vacancies in the specialty are already appearing on HeadHunter.



## CROSS-PROFESSIONAL SKILLS



# MULTI-PURPOSE ROBOTIC SYSTEMS DESIGNER

Professional engaged in controlling and servicing robotic systems, including in complex and dangerous facilities and in dealing with hard-to-reach or microscopic objects. The job is already on offer. General director of the Chebarkul Milk Factory, who announced a transition to automated production in 2014, made this comment: “We have a lot of work done manually now, but when we have had the production lines automated, we will need people to maintain the equipment”.



## CROSS-PROFESSIONAL SKILLS



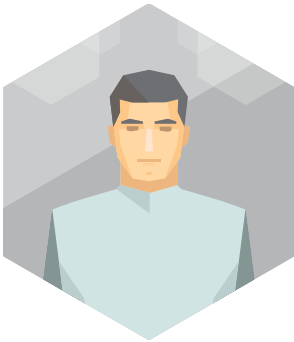


# ERGONOMIC DESIGNER

Specialist tasked with designing robotic systems taking into account the user's ergonomic requirements, based on their physical and mental abilities.



## CROSS-PROFESSIONAL SKILLS

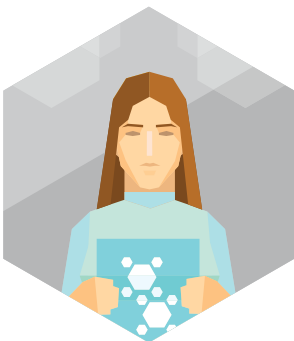


# COMPOSITE ENGINEER

Specialist engaged in selecting composite materials to manufacture parts, mechanisms and joints for robotic devices with preset properties, not without the use of 3D printing.



## CROSS-PROFESSIONAL SKILLS



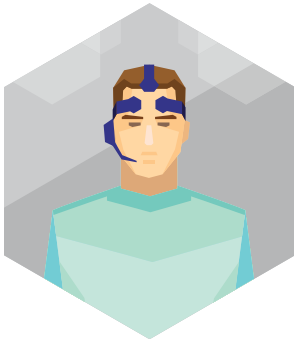
# CHILDREN'S ROBOT DESIGNER

Professional involved in designing children's toys, games, gadgets and various mechanical commodities based on programmable robots, taking into account the mental and physiological specifics of young age.



## CROSS-PROFESSIONAL SKILLS



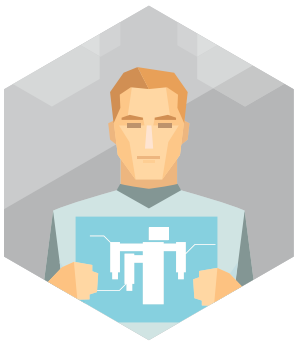
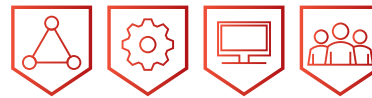


# DESIGNER OF NEURAL INTERFACES FOR ROBOT CONTROL

Specialist who designs control systems for industrial and combat robots based on neural interfaces, enabling control by distributed teams as well as individual operators.



## CROSS-PROFESSIONAL SKILLS



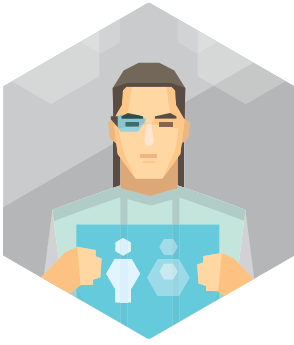
# MEDICAL ROBOT DESIGNER

Professional designing biocompatible robotic systems and devices for medicine and biotechnology (e.g. robot surgeons, diagnostic robots, robotic prostheses, etc.).



## CROSS-PROFESSIONAL SKILLS





# HOUSEHOLD ROBOT DESIGNER

Professional tasked with designing and programming household robots (e.g. babysitter, cleaner, washer, gardener, dog walker, etc.), which will help run the house. These robots are integrated with other components of a smart home and can move around and perform complex household work.



## ROBOT DESIGNERS' CHATROOM

- 13:56 ROBOMASTER:**  
Tolya, how's your robot bartender doing?
- 13:56 CYBERTOLYAN:**  
She's fine. Margarita-2 has learned 16 recipes already, though we can't seem to teach her to make layered cocktails. I guess it's too delicate an operation. And her vocabulary is not quite enough for keeping a conversation
- 13:58 ROBOMASTER:**  
Just remember to add a "no more for this guy" function :)
- 14:02 CYBERTOLYAN:**  
Hey, that's interesting. Install a speech articulation recognition programme, build in a breathalyzer... Thanks for the tip! How's your babysitter?
- 14:03 ROBOMASTER:**  
Alex and I altered and enhanced the frame a bit, so now it can not only call an ambulance or remind a person to take their medication, but actually carry a patient weighing up to 80 kg. Weight sensors will determine the weight and ensure the robot's stability.

job  
to emerge  
after 2020



## CROSS-PROFESSIONAL SKILLS





## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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In the above jobs, you can receive only good basic training at the universities listed below. Specialized training programmes will appear either in the same universities or in corporate universities, or beyond traditional institutions, offered by global education providers (Coursera, EdX, and other providers of multi-user online courses).

- Moscow Institute of Physics and Technology (MIPT)
- National Research Tomsk State University (TSU)
- National Research Nuclear University MEPhI (Moscow Engineering Physics Institute)
- Tomsk Polytechnic University (TPU)
- ITMO University (Saint Petersburg)
- Moscow State University of Information Technology, Radio Engineering and Electronics (MGTU MIREA) (Department of Biotechnological and Medical Devices and Systems)
- Far Eastern Federal University (FEFU)

## ROBOTICS AND MECHANICAL ENGINEERING EMPLOYERS IN THE RUSSIAN FEDERATION

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- United Heavy Machinery Plants (OMZ)
- ROSTSELMASH Group
- Komsomolsk-on-Amur Aircraft Production Association (KNAAPO)
- Uralvagonzavod
- Power Machines
- Izhmash
- NPO Saturn
- Energomash (Belgorod) – BZEM
- Concern Tractor Plants

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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The Russian mechanical engineering sector is represented by companies with many years of experience (between 25 and 90 years), brought up in the traditions of Soviet military technology. Most of them produce traditional machines and equipment with a limited number of intelligent functions. The dawn of robotics in the world coincided with a decline in the Russian industry, which is why most companies in the Russian robotics sector are representative offices of major global concerns and businesses (KUKA Roboter GmbH, ABB, FANUC Robotics, etc.). They introduce their designs at Russian enterprises in various industries and have their own training centres in the country. Domestic players promoting robotics in Russia are young, small and medium-sized businesses (Rbot, Robotics, RoboCV, AvtoVAZ, NPO Taris, etc.). In 2018, Tomsk State University is to host a world competition in robotics.



# LIGHT INDUSTRY

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## HOW IS THE INDUSTRY CHANGING?

Light industry has a rather unfortunate history in Russia. It had never been a priority in the Soviet era, while in the 1990s, production volumes dropped fivefold. Although the sector is still very backward in terms of productivity, it has seen slight recovery owing to the emergence of small niche companies producing clothes, footwear and accessories. In the future, some of them are likely to achieve considerable success, having learned to predict global fashion trends and mastered advanced management techniques.

What trends will drive the development of the industry in the coming years?

Natural fabrics, such as linen, cotton, viscose and others, are growing more expensive and are therefore being replaced with advanced synthetic materials. Demand is rising for high-tech smart fabrics (self-cleaning, fluorescent, or those that accumulate solar energy). Spaniard Manel Torres has invented a spray-on fabric, which is sprayed over the body from a can. Italian designer Mauro Taliani made a shirt with “shape memory”, which changes sleeve length depending on the weather and the wearer’s body temperature. Clothing items are often fused with wearable gadgets, from snowboarder jackets with built-in radios to T-shirts with displays and mp3 players. The future will also have demand for fabrics made of custom-grown natural materials

with preset properties, such as special GMO linen for crease-resistant fabrics.

Another trend is the personalization of clothes and development of small-scale production. Custom online tailors and stores are also appearing where a user can choose the color of a shirt or jeans, or have a shirt made to a specific order, after choosing the material and design and submitting their measurements. Development does not stop here. As 3D printing is growing cheaper, a 3D printer will appear in almost every home in the foreseeable future. After downloading a drawing from the Internet, you can print out a smartphone case or a plastic souvenir. Professional designers even create entire clothing and footwear collections using this technology. With increasingly cheaper production processes, intellectual property will be of the highest value, with fashion-obsessed people chasing the latest 3D drawings. To get new clothes, you will only have to visit the website of your favourite brand or designer, buy a cartridge with the necessary material, and download the 3D model of the dress you like. Then you can take the model to the nearest automated tailor shop, upload it into a decoding terminal, and adjust the future dress to your size in a virtual fitting room. After that, the dress will be made by an automated production line. Prototypes of such devices already exist.

Future clothes will be comfortable and environmentally friendly, creating demand for materials that are the most salubrious (warming, transpiring, disinfecting, etc.) and harmless for the environment (biodegradable or energy accumulating). In 2013, the London designer Shamees Aden presented a prototype of regenerating sneakers made of a biomaterial resembling a second skin. After wearing, the sneakers can be restored in a special solution. Additionally, technologies will be needed to recycle 3D printed clothes back into material for cartridges, as people quickly grow bored of clothes but consider throwing them out as wasteful.

Mass production will also be automated: even now designers model clothes using graphic processors (such as Virtual Fashion Professional), with special machines cutting the patterns. Apart from that, clothes manufacturers are looking for solutions to reduce waste during cutting.

Life rushing on, and an increasing number of buyers are giving preference to online shopping, which means clothes producers will have to learn to sell them via the Internet. Some Russian brands are successfully positioning themselves in the online market such as the basic clothing brand "Oh, My", which targets those who want to buy simple clothes, such as single-tone T-shirts, vests or socks. Some online stores offer users virtual fitting rooms, which can at least help shoppers choose the right design. However, most of these fitting rooms only work with 2D images, which cannot provide a clear vision of how a thing will fit. Still, you can get a full 3D scanning of your body within 12 seconds with the help of the special Shapify Booth. The technology will soon be available to everybody, and we will build 3D models of our bodies, with special software calculating whether clothes will fit well.

**POSSIBLE FUTURE CHALLENGES:**

- Technology consulting for clothes producers
- Designing natural materials with preset properties
- Integrating production and designer solutions with materials science
- Recycling old clothes (including 3D-printed)
- Creating smart materials and fabrics
- Developing electronic 3D models for clothes production
- Designing interfaces for virtual fitting rooms
- Programming robots for clothes making

## CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



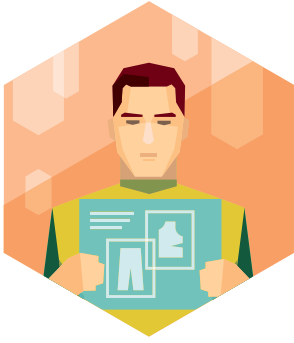
Lean production



Artistic skills



Environmental thinking



# IT INTERFACE DESIGNER FOR LIGHT INDUSTRY

Specialist developing software for designing 3D clothes, patterns, and virtual fitting rooms.

job to emerge before 2025  
to 20 y.

CROSS-PROFESSIONAL SKILLS

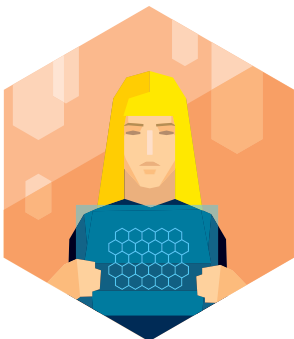


# TECHNO-STYLIST

Specialist at the crossroads of design and IT, combining clothes with wearable gadgets as decorations or for specific purposes. For example, there are hug shirts, equipped with special sensors: if you hug yourself, they transmit this information to a smartphone, and a person with the "twin" shirt will feel your virtual hug.

job to emerge before 2025  
to 20 y.

CROSS-PROFESSIONAL SKILLS



# ADVANCED FABRICS DESIGNER

Specialist engaged in designing new synthetic fabrics and materials with preset properties (e.g. LED or shape memory fabrics).

job to emerge before 2025  
to 20 y.

CROSS-PROFESSIONAL SKILLS







# HEALTHY CLOTHES EXPERT

Controls clothes manufacturing in terms of safety and health benefits (heat insulation, ventilation, etc.) and designs medical clothes, such as fabrics treated with a disinfectant.



CROSS-PROFESSIONAL SKILLS



# CLOTHES RECYCLING SPECIALIST

Professional with knowledge in ecology and materials science, developing optimal methods for recycling and re-use of old clothes.



CROSS-PROFESSIONAL SKILLS



# CLOTHES 3D MODEL PROGRAMMER

IT specialist tasked with translating the designer's clothing sketches into instructions for a robot or 3D printer. In the future, users will be able to use them to print their own clothes, or have them made by an automated tailor shop.



CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- National University of Science and Technology (MISiS) (Nanomaterials, Materials Science and Advanced Materials Technology)
- N.E. Bauman Moscow State Technical University (BMSTU) (Materials Science and Advanced Materials Technology)
- D.I. Mendeleev University of Chemical Technology of Russia (MUCTR)
- A.N. Kosygin Moscow State Textile University
- British Higher School of Art and Design
- Moscow State University of Design and Technology
- St. Petersburg State University of Technology and Design
- Omsk State Institute of Service (Department of Design)

## LIGHT INDUSTRY EMPLOYERS IN THE RUSSIAN FEDERATION

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- ◆ Paninter
- ◆ Carlo Pazolini
- ◆ Pskov Clothing Factory Slavyanka
- ◆ Bolshevichka
- ◆ Gloria Jeans
- ◆ Ralf Ringer
- ◆ Oodji
- ◆ MONDIGO clothing factory
- ◆ Marlon Fashion Group (Zarina, Love Republic and Befree brands)
- ◆ Gamma



# CHILDREN'S PRODUCTS AND SERVICES

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## Antonina Tsitsulina

President, Association of Children's Industry Companies (AIDT); Member of Coordination Council under President of the Russian Federation for the Implementation of National Strategy of Actions for Children; Member of Public Council of Council of Ministers of Industry and Commerce of the Russian Federation

Future professionals must be able to work in teams and in projects, find and use information, adapt together with their industry, both in terms of occupational and personal competences.

For example, there is the child development expert, as well as the parenting coach. These are jobs vital for human safety and standards of living. Their work will be divided between all kinds of past competences, which will mix when a specialist is a designer and manager at the same time.

## HOW IS THE INDUSTRY CHANGING?

Children's products and services play an important part in the life of a society: the games children play now will influence their future interests, values and perception of the world around them. This means that every item intended for children must be designed primarily as an educational product containing a game component.

The children's industry has not been an industry in itself until lately. Children's furniture was made by furniture producers, children's clothes were made by light industry, and children's food was produced by the food industry. This often led to a situation where children's needs were simply neglected by producers. The sector was recognized by the state as an independent industry only in 2013.

Several important processes are now happening in the area. The first is

mediatization, with 90% of products being made are based on long multi-character stories (e.g. cartoon series). Media characters shape the notions of values and behavioral standards in children's minds. For example, every episode of the Smeshariki series deals with a difficult situation that a child may face in his life.

Second, the current most successful strategy is to create long-lasting educational products (i.e. existing in different media: comic books, cartoons, computer games, toys), growing together with the child and helping him meet new challenges. For example, Lego products follow a path from simpler parts and scenarios to those more complicated, with the child able to play with construction sets as well as online games, or watch a feature film with his favourite characters.

**POSSIBLE FUTURE CHALLENGES:**

- Ensuring children's product safety (primarily psychological)
- Creating end-to-end stories that develop along with the child
- Coordinating the development of media characters
- Managing creative teams of children creating new products
- Shaping children's future thinking skills
- Developing individual development pathways for different children

CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



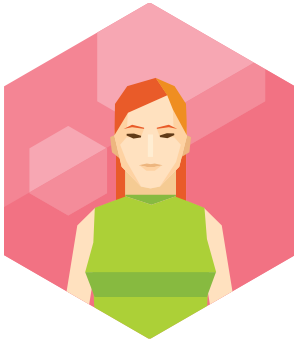
Lean production



Artistic skills



Environmental thinking



# CHILDREN'S R&D MANAGER

Specialist who organizes children's creative activities to invent new children's products, and adapts their ideas for mass production. Sometimes, children manage to invent with more interesting designer solutions than a team of adult professionals. For example, in 2007, the entrepreneurial artist Wendy Tsao from Vancouver started making stuffed animals based on her four year old son's drawings. The hobby turned profitable, and she opened her own business called Child's Own Studio. Now parents from different countries order Wendy's plush toys based on their children's pictures. The famous artist Damien Hurst admitted in 2014 to have used his own childhood ideas in his art.



## CROSS-PROFESSIONAL SKILLS



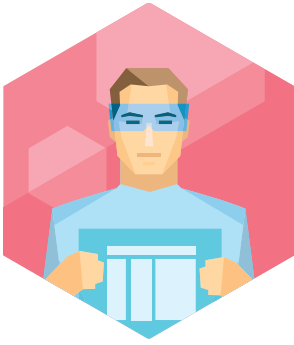
# CHILDREN'S PSYCHOLOGICAL SECURITY SPECIALIST

Professional tasked with testing various children's products and services (toys, games, cartoons, clothes, furniture, etc.) for psychological threats and potential harm for children's health. Based on the tests, the specialist provides recommendations on corrections to be made to the product, or its possible applications.



## CROSS-PROFESSIONAL SKILLS





# TRANSMEDIA PRODUCT DESIGNER

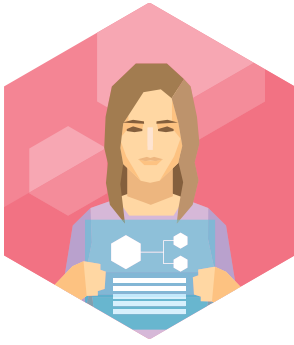
Specialist engaged in designing content (characters, stories, conflicts, problems, educational content) and services for several mass media at once (TV programmes, games, etc.). He/she should be able to build a coherent system of interaction between different formats (consistency of character images and interrelation/consistency of stories involving them). The job will require unconventional thinking. For example, in one American school, students working on an art project encoded the text of a poem as software code, imported it into the Scratch training animation program, and then into LEGO Mindstorms EV3, a robot programming language. The interactive children's series *Inanimate Alice* uses text, video, images and interactive games.



## CROSS-PROFESSIONAL SKILLS







# CHILDREN'S FUTURE IMAGE EXPERT

Specialist involved in shaping the possible image of the future life of a child and his development pathway, based on the parent's wishes and the child's own abilities and perceptions. This specialist will pick matching educational programmes (artistic, sports, etc.), educational games and software to help a child master new skills on a selected trajectory.



## NOTES BY A CHILDREN'S FUTURE IMAGE EXPERT

### CUSTOMER:

*Vanya, 9 years old.* Not sure what he wants to be himself, but parents want him to be a programmer.

A clear introvert, spends much time playing by himself. Dislikes collective tasks at school. Able to concentrate on a problem for a long time. No leader ambitions.

Deals well with math problems, fond of gadgets, familiar with mobile apps. Shows a keen interest in nature and biological structure of living beings. Asks a lot of questions about animals and the universe.

### RECOMMENDATIONS:

Apparently, the boy has potential in areas spanning IT and biology. Judging by his character, he would be more comfortable with a research job than with management. Possible development areas are: IT medicine, IT genetics, clinical bioinformatics. Option: space biology or design of sci-fi virtual worlds.

### POSSIBLE DEVELOPMENT PLAN FOR NEXT YEAR

Groups: get him signed up into specialized children's laboratories at the Polytechnic Museum and a software development group.

Games: introduce the boy to Fold.It and other biology-related mind teasers.

Books: pick encyclopedias and popular science books on the subject.

Consider entering a specialized school at the age of 11 or 12.



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Moscow State Pedagogical University
- Herzen State Pedagogical University of Russia
- Moscow State University
- Russian State University for the Humanities
- St. Petersburg State University of Technology and Design
- Higher School of Folk Art (Institute) (provides training in artistic toy design and modelling)
- Siberian State University of Telecommunication and Information Sciences
- Far Eastern State University of Humanities

The distinctive feature of jobs in the industry are requirements for the knowledge of child psychology and physiology (including work with mentally challenged and disabled children). There are no separate curriculums for engineers, programmers and managers in the children's product sector. Institutions should combine psychological training and teaching with training in engineering, information technology, and management.

## CHILDREN'S PRODUCTS AND SERVICES EMPLOYERS IN THE RUSSIAN FEDERATION

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- ◆ Detsky Mir Group
- ◆ Walt Disney Company CIS
- ◆ Lego Russia
- ◆ Mattel
- ◆ Vesna
- ◆ Masha and the Bear
- ◆ Moscow Toy Factory

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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Producers of the segment are present in many industrial sectors, such as footwear, clothes, food, furniture, educational and media software, toys, safety devices, etc. Some companies (e.g. clothing producers) have children's product divisions, whereas others (e.g. toy producers) specialize exclusively in children's products. The state recognized the sector as an independent industry only in 2013.



# EDUCATION

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## HOW IS THE INDUSTRY CHANGING?

Education has always been regarded as a very conservative area, but the current technological advance is altering our perception of the methods of acquiring knowledge and calls for a thorough revision of how we approach the educational process, which will create a high demand for education specialists in the future.

Firstly, education is beginning to use IT-enabled tools, such as online courses, simulators, trainers, and online virtual worlds. This opens up new opportunities, as students are not only acquiring necessary knowledge but are also developing information handling skills. They are also learning to enter productive states of consciousness for better concentration and for performing complex creative and analytical tasks. There is, for example, the flow state, when a person is totally immersed in the creative process and feels no anxiety about possible success or failure.

Secondly, new technology is making education more targeted. There is no longer the need to adjust to general timetables or the wishes of the group. The educational process can be quite easily adapted to the requirements of a particular student and his or her individual specifics. You can choose the format of education and its tempo, focusing on a very specific area or, otherwise, take up an uncommon interdisciplinary

curriculum. For example, the Massachusetts Institute of Technology offers its students a course called Food and Power in the 20th Century, at the confluence of social science, politics and anthropology, while Berkeley students can now learn philosophy based on examples from The Simpsons.

Distances no longer matter either, as many prestigious universities broadcast their courses online to anywhere in the world. In the future, distant schools and universities will become an equal alternative to the traditional auditorium-based educational process, with "electronic mentors" supervising the process and helping students master the programme.

Game-based forms of education will be used more often, as games help a student master a subject.

The world is changing so rapidly that we can no longer afford to spend five years learning theory and then some more time becoming familiar with the job at the expense of an employer. This is why education is becoming increasingly subject-targeted and practice-focused, especially for college students and adults. This means that accents are shifting from theory toward real projects implemented by students, including their own startups. In addition, schemes are appearing, allowing students to learn and work at the same time. Thus, in 2013, Russia launched the Dual Education project

in ten pilot regions, allowing for job practice without having to miss classes.

Finally, other than being a springboard into independent living, education will become a continuous process taking up the entire life of a person. The very notion

of “profession” is becoming obsolete, giving way to a flexible set of skills and competences required to handle a certain set of tasks. This set can be augmented with new skills and “reconstructed” into another profession.

### POSSIBLE FUTURE CHALLENGES:

- Designing academic pathways
- Leading students along academic pathways
- Development of online courses
- Development and support of educational online platforms
- Project management
- Development of game-based practical tools and methods
- Holding game and educational activities
- Designing virtual worlds for education
- Development of cross-professional skills (teamwork, systems thinking, lean production, etc.)
- Development of cognitive abilities (memory, reading speed, concentration, etc.)
- Teaching productive states of consciousness
- Development of educational and re-training programmes for adults

#### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



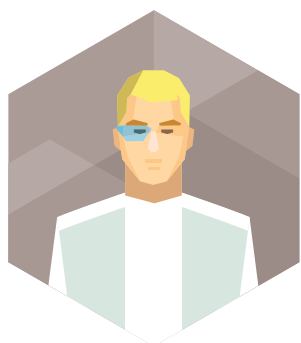
Lean production



Artistic skills



Environmental thinking

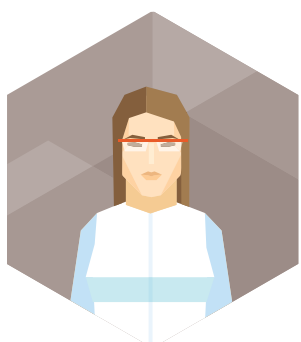


## EDUCATIONAL ONLINE PLATFORM COORDINATOR

Specialist in an educational institution or independent educational project with competences in online teaching, supporting the development of online courses on particular subjects or disciplines; organizing and promoting specific courses or standard academic pathways. The coordinator moderates communication between teachers and students within courses or platforms and defines requirements for platform improvements. Some Russian universities have established entire divisions in charge of these functions. For example, MIPT has the Laboratory of Innovative Educational Techniques, and the Higher School of Economics has the Educational Environment Development Centre. This has allowed the universities to develop their own online courses for the Coursera platform. Russian online platforms, such as Universarium and Eduson, are also developing.



### CROSS-PROFESSIONAL SKILLS



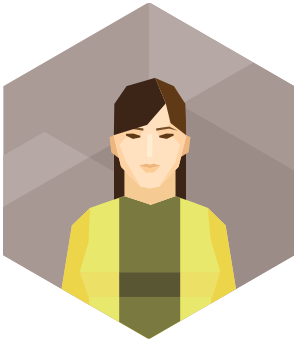
## STARTUP MENTOR

This professional has experience in launching their own startup projects, supervising new startup teams, teaching them business skills on case examples from his or her own projects. In the West, the mentor is a developed specialty, whereas in Russia it is just beginning to grow popular due to the poor condition of small business. Nevertheless, business incubators and accelerators (e.g. the HSE business incubator, Skolkovo Startup Academy, and the venture academy LaunchGurus) already have their own mentorship programmes. Independent specialists' services are also in demand.



### CROSS-PROFESSIONAL SKILLS



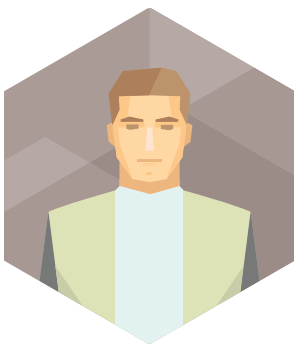


# MODERATOR

Specialist who organizes group discussions of an issue or collective creative activities to help students learn new material during their practical activities. The set of skill required in social science, psychology and marketing is becoming sought after in education. For example, in 2014, the U.S.-based Corporate Education Group, specializing in consulting and corporate training, posted a vacancy for a virtual course moderator, while ATIM worked out a series of training courses for mentors and moderators, including a course in online commerce. Moderators are actively engaged in the Russian educational sphere, e.g. most educational programmes of the SKOLKOVO Moscow School of Management involve moderators.



## CROSS-PROFESSIONAL SKILLS



# GAME MASTER

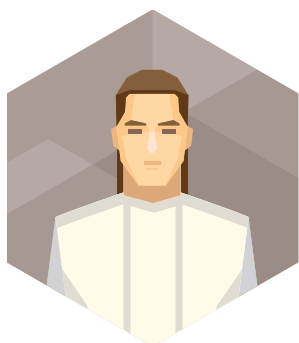
Specialist in developing and organizing educational games (business, history, science fiction, etc.) and game support with the use of simulators. The educational potential of games has been studied in developed countries since the 2000's (in 2001, MIT and Microsoft launched the joint project Games-to-Teach), while lately, gamification (application of game mechanics in non-game processes) has become a noticeable trend. In 2013, the educational portal Coursera published the course Computer Games and Education, and the University of New York even offers a master's programme for game masters. In Russia, the development of educational games is promoted by the Russian Association for Games in Education.



## CROSS-PROFESSIONAL SKILLS





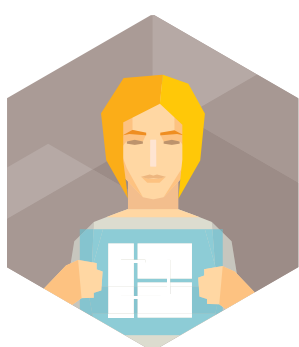


# TUTOR

Educator engaged in supporting individual development of students within disciplines of an educational programme, elaborating individual tasks, and providing career guidance.



CROSS-PROFESSIONAL SKILLS

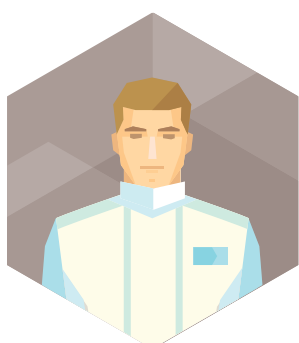


# PROJECT TRAINING ORGANIZER

Professional in the development and organization of training programmes focused on the preparation and implementation of projects in the real sector of the economy, with the study of theoretical material as a mandatory support activity.



CROSS-PROFESSIONAL SKILLS



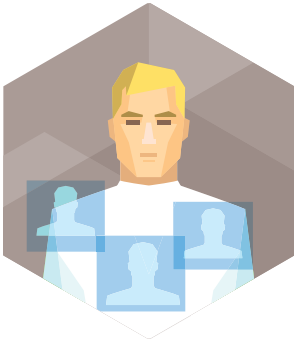
# ECOPREACHER

Specialist tasked with developing and conducting educational and instructional programmes for children and adults, teaching them to behave in a way to reduce impact on the environment (no excessive consumption, separate waste disposal, environmentally conscious lifestyle, etc.), as well as programmes for industrial enterprises on more eco-friendly industrial practices.



CROSS-PROFESSIONAL SKILLS





# MIND FITNESS COACH

Specialist who develops programmes for training personal cognitive skills (e.g. memory, concentration, reading speed, mental mathematics, etc.) using special programmes and devices, taking into account the psyche and purposes of the user. Such programmes exist already, for example, the Mind Fitness Training Institute in Virginia offers all those willing a seven-day course to train their cognitive skills, while Lumosity has developed over 40 online cognitive training games.



## CONVERSATION ON A DATING WEBSITE

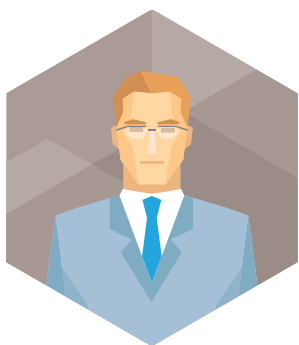
- 13:56 DENNIS:**  
It says in your profile that you're a fitness coach. I like athletic girls :)
- 13:58 HATAWA:**  
I like physical training, yes, but my job is mind fitness – that's a very special sport.
- 14:02 DENNIS:**  
What is it?
- 14:03 HATAWA:**  
I help people train their mind, e.g. memory, concentration, spatial thinking.
- 14:02 DENNIS:**  
Wow. That's some job! How do you do it? Do you have training equipment?
- 14:03 HATAWA:**  
Let's say you want to train an ability, e.g. perfect self-possession on a responsible mission. We connect sensors to your head to track your brain activity and put you into a virtual game, such as using your mind to control a UFO. As long as you are focused and calm, it's flying. As soon as you get nervous or distracted, it begins to fall. Over time, you will learn to perfectly control the UFO and will be able to enter this state in real life.
- 14:02 DENNIS:**  
You've intrigued me. Would you like to tell me more about it over a cup of coffee?
- 14:03 HATAWA:**  
Better let's go skating :)

job  
to emerge  
after 2020



## CROSS-PROFESSIONAL SKILLS



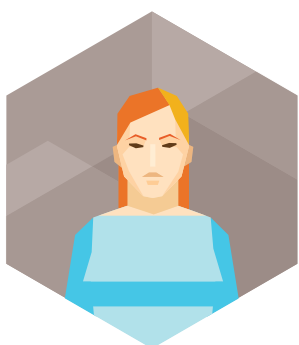


# EDUCATIONAL PATHWAY DESIGNER

Professional in building an educational “route” for new specialists, made up of courses provided by educational institutions, including online programmes, as well as trainers, simulators, internships, etc. Based on those, he/she develops an educational track, taking into account the psychological type, abilities, and goals of a particular person.



## CROSS-PROFESSIONAL SKILLS



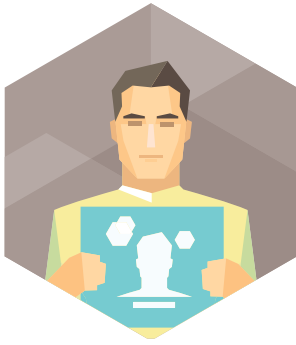
# GAME EDUCATOR

Specialist in the development of educational programmes based on game techniques, acting as a game character. This specialist will replace traditional teachers at school. Russia has long-standing traditions of game-based education. The promotion of games in schools is currently restricted mostly by regulatory framework.



## CROSS-PROFESSIONAL SKILLS





# DESIGNER OF CONSCIOUSNESS TRAINING TOOLS

Creates programmes and equipment (e.g. biofeedback devices) to train users in entering productive states of consciousness (high focus, relaxation, increased creative abilities, etc.). For example, Wild Divine sells devices and software to teach users concentration, relaxation and awareness. There are also biofeedback devices, developed specially for lucid dreaming.



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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Although Russia has universities training teachers, none of them trains specialists in new educational techniques, with many resisting new methods. Therefore, we advise those who want to be involved in new education practices to receive high-quality structured education in one of the country's leading universities and then enter practical communities on new educational methods and obtain the necessary skills in actual work. However, if you want to teach at a school, you will not be admitted without a teacher's certificate, so here is a list of schools considered to be leaders in the field.

- Moscow State Pedagogical University
- Herzen State Pedagogical University of Russia
- Moscow State University
- Russian State University for the Humanities
- Sholokhov Moscow State University for the Humanities

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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In Russia, professional educators can work in a high school or higher educational institution, most of which are state-owned. An increasing number of Russian corporations pay attention to their employees' development and create their own training centres or corporate universities. New educational formats are emerging mainly in additional education for children and adults, including in IT companies developing simulators or game software for education.



# IT SECTOR

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## Roman Sorokin

Educational Programmes Manager, Cisco Russia

Today, the volume of monthly data traffic on the World Wide Web is measured in exabytes and material objects connected to the Internet have long since outnumbered the global population and keep multiplying. Before our very eyes, interaction between things, data, processes and people is creating new benefits and opportunities everywhere, from mainstream user services to highly specialized industrial processes, to mineral extraction, to smart cities. The economic potential of this interaction is immense.

Tomorrow, very few new products and services in the market will function without communication capabilities. On one hand, this will impose unprecedented requirements on the network infrastructure, thereby increasing the already unsatisfied demand for industry specialists. On the other hand, it will impose new cross-sector requirements on the qualifications of all specialists involved in the development and promotion of new products and services. Before long, everybody will become a network expert at their own level.

## HOW IS THE INDUSTRY CHANGING?

Information technology is one of the fastest-growing sectors of the economy. Changes occurring in the sector open up new and seemingly incredible opportunities in other areas such as design, transportation, staff and resource management, marketing, and education.

A number of significant processes are now happening in the IT sector. To begin with, telecommunication solutions provide links between various parts of the world. The volume of data transmitted over networks is increasing, leading to the improvement of data processing solutions. The industry is going to be revolutionized by Big Data, which will help solve the problems of early diagnosis, or create computer systems for simultaneous interpreting, taking into account all linguistic peculiarities.

Also, digital solutions are becoming increasingly mobile and user-friendly. With almost every family owning a laptop computer and every other person on the planet using a smartphone, in ten years' time every urban citizen will have at least five or six interconnected wearable gadgets, e.g. augmented reality glasses, a fitness bracelet, and a smartphone with a smart wallet feature. Gadgets will take care of your athletic shape and daily regimen, help you organize your timetable, and suggest an optimal solution in various situations, e.g. where to have breakfast in a given part of town based on your dietary preferences, or what to do in the evening when you are in a particular mood.

Growing data volumes will call for new security systems, data filtering and protection

tools, not least because the proliferation of cloud-based systems increases the dangers of a data leak. Within the next 10 years, technologies will appear for precise identification of Internet users, with each and every click tracked. Technologies from science fiction and spy films will become a reality. The user of a device will be identified not only by his/her fingerprints or with a retina scan, but also through a DNA test. This will lead to deanonymization and total transparency, which, on one hand, will have a dramatic effect on Internet behaviour, and on the other, will cause protests and calls for anonymity.

Technologies will develop for checking data traffic integrity and information reliability, and verifying its sources. Demand will arise for insurance institutions providing protection against risks related to virtual environments, as well as for consulting agencies dealing with user security and image on the Internet. With many documents (even identification cards) gradually translated into electronic form, personal data may come under threat of total loss due to hacking attacks or system failures, which calls for new data protection solutions.

The increasingly powerful cyber-attacks against important facilities such as banks, telecommunications, media publishers, etc., are raising the question of their information security. In the distant future, programmes will become capable of cyber crime, on par with humans.

The boundaries between virtual reality and the physical world are becoming fuzzier,

which means that the digital society will be organized in roughly the same way as in the real world, including state borders and government control. The “digital gap” between people (in terms of computer literacy) will create a new type of social stratification, leading to the emergence of special programmes for mass education in information and communication technology. Laws regulating the cyberspace will appear everywhere. “Electronic” governments will become fully operational and more interactive.

Moreover, virtual reality is turning into an intermediary between the user and the real world, with more and more remotely controlled smart devices and machines. This makes life easier, though it means that the virtual world can be used to attack physical objects. For example, criminals will be able to remotely block, damage or destroy a production line or transpiration network. The automation of processes is increasing the number of sensors connected to data networks to monitor system states. This, in turn, makes the infrastructure more vulnerable. For this reason, strong protection techniques need to be developed for smart networks and the Internet of things, along with alternative ways to manage them in a critical situation.

Innovations in other industries appear at a juncture with IT, spawning multiple potential cross-sector breakthrough points. However, the development and production of hardware, software and security systems still remain priorities in the sector.



**THE FOLLOWING WILL BE THE BREAKTHROUGH POINTS IN THE COMING DECADES:**

- Increasing data traffic and data processing models (Big Data)
- Proliferation of software changeable by ordinary users
- Expansion of human-machine interfaces (biofeedback devices, neural interfaces)
- Artificial intelligence technology (the renowned futurologist Raymond Kurzweil has predicted that Artificial Intelligence will have caught up with human intellect by 2029)
- Semantic systems dealing with the meanings in natural languages (translation, Internet search, human-computer communication, etc.)
- New quantum and optical computers, substantially speeding up the processing of massive data arrays
- Development of neural interfaces, including control of various objects by thought, transmission of sensations and emotions over distances. For example, in 2013, scientists from the University of Washington presented the world's first interface for transmitting direct signals between the brains of two human beings: an imagined action of the one invoked an actual movement by the other. Experts from the Russian-based Neurobotics have developed a helmet equipped with EEG sensors, enabling the wearer to control a flying drone.

**POSSIBLE FUTURE CHALLENGES:**

- Gathering and structuring personal data on the Internet and analyzing the same in terms of security and access isolation levels
- Consultations on Internet security
- Restricting access and introducing personal accountability for information handling
- Ensuring the level of privacy required by the user
- Protection against manipulation from virtual environments
- Ensuring the most accurate user identification possible
- Protecting data transmission channels
- Consistent fight against organized cyber crime and cyber terrorism (application of real-world experience to cyberspace)
- Moderating electronic government systems The emergence of a two-way communication channel between authorities and citizens will require solutions for moderating and managing communications
- Ensuring the continuity of business processes (in case of IT system failures)
- Closing of the digital gap and mass ICT education for the population
- Large data array processing
- Developing data storage standards
- Developing data visualization standards
- Risk management for information and communication systems
- Ensuring integrated security of information and communication systems from cyber-attacks, data leaks, and virus attacks
- Developing biochips and other similar devices built into the body and exchanging data with the external environment
- Legal protection on the Internet (protection of property, issues arising during communication on the Internet, games and virtual realities).
- Developing algorithms for semantic search and translation, and ensuring human-computer communication

## CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



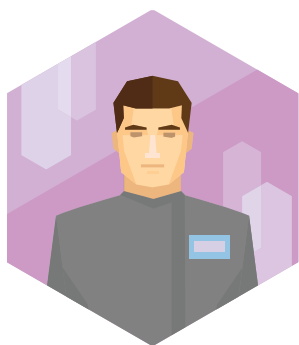
Lean production



Artistic skills



Environmental thinking

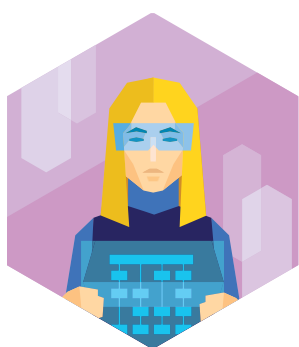


# INFORMATION SYSTEMS ARCHITECT

Qualified specialist for a wide spectrum of operations involving data processing systems. In particular, this specialist designs databases, develops action algorithms, ensures effective access of users to data storages, controls the quality and logic of information storage and extraction. Such specialists are already in demand (65 vacancies were published in the specialty in July 2014, according to HeadHunter), and even more of them will be needed in the future, when information technology has penetrated all areas of human activity.



## CROSS-PROFESSIONAL SKILLS



# INTERFACE DESIGNER

This professional develops user-friendly, adaptive and safe interfaces for equipment, devices and software of various levels. He/she is highly competent in usability (creating interfaces most comfortable for the user). The interface designer is an existing and popular job, with 2,015 vacancies published in July 2014, according to HeadHunter. However, the growing intensity of human-machine interaction will require greater numbers of such specialists, while their skills will need further development to be able to achieve new objectives.



## CROSS-PROFESSIONAL SKILLS





## ONLINE LAWYER

Specialist engaged in shaping regulatory interaction on the Internet (including virtual worlds) and devising legal protection systems for people and property on the Internet (including virtual property).



### CROSS-PROFESSIONAL SKILLS



## IT PREACHER

Specialist in communications with end users of IT products and promotion of new solutions to groups having a conservative attitude towards advanced technology. The IT preacher will teach people to use new software and services to reduce the digital gap. Activities aimed at training people in “digital literacy” are offered today, usually on a voluntary basis, but this will become a real job in the near future.



### CROSS-PROFESSIONAL SKILLS



## DIGITAL LINGUIST

Professional who develops linguistic systems for semantic translation (translation taking into account context and shades of meaning) and text information processing (including semantic search on the Internet). He/she also develops new communication interfaces between man and computer using natural languages.



### CROSS-PROFESSIONAL SKILLS



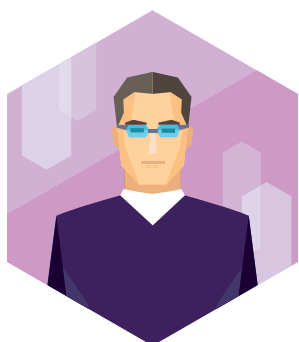


## BIG DATA MODEL DESIGNER

Specialist in designing systems for collecting and processing large arrays of data received from the Internet, and developing analytical models and interfaces for assembling them. There are open vacancies in the specialty in Russia, though demand is not very high yet.



### CROSS-PROFESSIONAL SKILLS

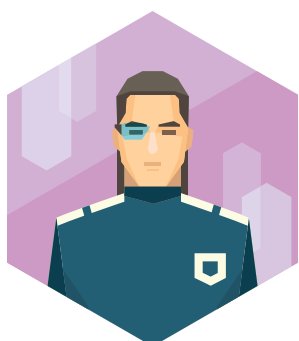


## IT AUDITOR

Specialist in software development. Audits complex IT systems processing data and making decisions based on such data. Errors in, or breach of, such systems pose high risks. Provides audits of such systems for the security of their software, including the process of its development and qualifications of the developer.



### CROSS-PROFESSIONAL SKILLS



## CYBER DETECTIVE

Specialist investigating cyber crimes. Specialist in criminal science, investigation (modern detective), search (including active search through officially sanctioned cyber attacks against suspects) and processing of information on the Internet (data analyst with programming skills). Cyber detectives have, in fact, been around for some time now, and demand for them will only grow in the future.



### CROSS-PROFESSIONAL SKILLS





# PERSONAL PROFILE SECURITY ADVISOR

Advisor on the information security of Internet users. Compiles the current information image of a client based on all of the information about them available on the Internet. Audits the client's activities on the Internet for weak spots, confidentiality and general security. At the client's request, eliminates weak spots, edits (or deletes) the user's information on the Internet, and shapes the information image of the client.



## REPORT BY A PERSONAL PROFILE SECURITY ADVISOR

### CLIENT

Foma Kinyaev, age 35

Profile completeness is high. Active Internet user since 2002. Uses social networks frequently: VKontakte (1 post in 2 days on average); Facebook (3 posts a day on average). Also an active user of Habrahabr.ru, leprosorium.ru. Spends much time on online media websites.

### CONFIDENTIALITY LEVEL ON SOCIAL NETWORKS

Fairly high. Social network passwords are strong. Secret questions are complex; answers can't be found in public sources. Contacts on social networks are well-ordered. Only adds to friends list personal acquaintances or users with whom he shares at least five friends.

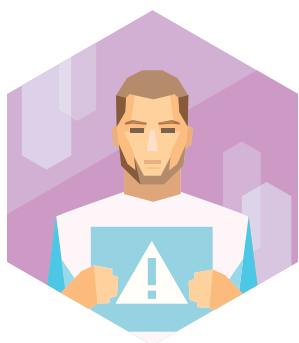
### WEAK SPOTS

- 1) Maintains highly important business correspondence on Facebook, which entails high risks in case of an account breach.
- 2) The profile has the same email address as his five-year-old Livejournal. The journal contains information that is not favourable for the client's image.
- 3) Often uses public Wi-Fi when posting, allowing the risk of a hacking attack or password leak.
- 4) The client's usual movements during the day can be tracked by his posts and photos over the past year.



## CROSS-PROFESSIONAL SKILLS





# INFORMATION SECURITY SUPERVISOR

Specialist in the information security of technological processes at automated industrial facilities. This supervisor ensures the security, protection and stable operation of process management systems and information processing, with a focus on tracking the emergence of new weak spots.



## CROSS-PROFESSIONAL SKILLS



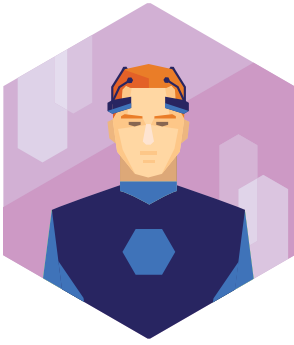
# SMART ENVIRONMENT CYBER TECHNICIAN

Specialist tasked with dealing with the lower levels of information infrastructure, ensuring the security of dedicated network segments at these levels (residential buildings and industrial facilities will presumably be separated from the Internet, to form their own secure segments connected to the common network via secure low-level connections).



## CROSS-PROFESSIONAL SKILLS





# NEURAL INTERFACE DESIGNER

Professional who designs interfaces compatible with the human nervous system, for controlling computers and household and industrial robots, taking into account the psychological and physiological traits of the user. Today, neural interfaces are used mostly for entertainment. For example, the Australian company Emotiv Epoc produces neural helmets for controlling characters in MMORPGs. In the future, however, neural interfaces will be used to control various sophisticated devices, or even to communicate nonverbally with other people (as in the DARPA Silent Talk system now in development).



## CROSS-PROFESSIONAL SKILLS





## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Lomonosov Moscow State University (Faculty of Computational Mathematics and Cybernetics)
- Moscow Institute of Physics and Technology (MIPT)
- ITMO University (Saint Petersburg)
- National Research Nuclear University MEPhI (Moscow Engineering Physics Institute)
- Tomsk Polytechnic University (TPU)
- Novosibirsk State University (NSU)
- National Research Tomsk State University (TSU)
- R.E. Alekseev Nizhny Novgorod State Technical University (NNSTU)
- Moscow Technical University of Communications and Informatics (MTUCI)
- Moscow State University of Information Technology, Radio Engineering and Electronics (MGTU MIREA)

## INFORMATION & TELECOMMUNICATION EMPLOYERS IN THE RUSSIAN FEDERATION

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- National Computer Corporation
- LANIT
- Envision Group
- TECHNOSERV
- ROSTELECOM
- Yandex
- ABBYY
- IBS
- 1C
- Parallels
- Kaspersky Lab
- IBM
- Cisco
- Microsoft
- SAP
- Intel Corporation

## COMMENTS ON THE JOB MARKET IN THE INDUSTRY

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Russia's IT sector is one of the global leaders in software production. There are several major and a multitude of small players on the market. Global brands are also active in Russia, with their own R&D departments in the country.



# FINANCIAL SECTOR

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## HOW IS THE INDUSTRY CHANGING?

The financial sector is a system within an economy that helps regulate the redistribution of capital, allocating it to projects most relevant for the market. The general trend in the new economy is the reducing number of human intermediaries, which are being replaced by automated systems. For this reason, many jobs in the sector (such as accountant or clerk) are becoming endangered and will eventually disappear in the coming years.

Nevertheless, the financial sphere may offer leeway for creativity and original thinking in matters related to funding large-scale or innovative projects, risk insurance, development of new tools for retirement savings, etc. In addition, the Internet is giving birth to new financing tools, such as crowd funding and crowd investing. New, digital code-based currencies (cryptocurrencies) are appearing, with other interesting processes underway.

## PROMISING AREAS IN THE FINANCIAL SECTOR:

- Alternative currency systems – cryptocurrencies (e.g. bitcoin) or local currencies (e.g. the Brixton pound in London, circulating within one borough)
- Reputation/merit economics (non-monetary commodity exchange where the currency is a person's reputation in a community, including their experience, connections, achievements, etc.)
- Crowd funding (gratuitous funding for ideas and projects by Internet users) and crowd investing (opportunity to invest in promising startups over the Internet)
- Direct investments in talent (investments in someone's education and projects on a remuneration basis)

**POSSIBLE FUTURE CHALLENGES:**

- Designing automation systems for routine processes
- Appraisal of intangible assets (including people)
- Design and management of currency exchange systems, including alternative and merit currencies
- Managing crowd funding and crowd investing systems
- Designing merit evaluation systems
- Diversifying risks using new investment tools

## CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



Lean production



Artistic skills



Environmental thinking



# INTELLECTUAL PROPERTY APPRAISER

Specialist in determining the value of intangible assets, such as ideas, business models, inventions, tangible and social technologies, etc. The job already exists in Russia, with the demand for relevant professionals exceeding the supply. According to HeadHunter, there were only 2 resumes for 14 vacancies in July 2014.



## SOCIAL DIARY

### 16/10 12:00 CHECK-IN AT AIRPORT

Flying to another TechCrunch conference. An investor friend asked me to assess the potential of a few promising startups. I'll have to get myself in order quickly after the flight, because the schedule is going to be a tight one. And how do you fight jet lag?

### 17/10 16:00 ARIANNA HUFFINGTON

Had a conversation with Arianna Huffington. Indisputably, she is a woman of outstanding intellect! By the way, I recently wrote to the HuffPost column on how to quickly appraise the value of an idea.

### 18:00 IPHONE 8

An acquaintance from Apple told me in secret some details about iPhone 8. The design is rather dull, but Siri will surprise everyone. No spoilers!).

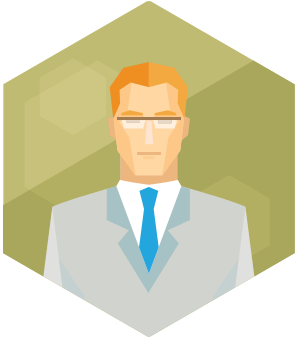
### 20:00 CARELESSNESS

It's amazing how carelessly people treat intellectual property. A couple of months ago, some fellow published openly on his blog a totally genius idea for Big Data analysis. Needless to say, it was immediately "borrowed" by an IT company – at absolutely no cost! Now they are giving a presentation at TechCrunch, and investors are bursting with excitement. The author could have made a fortune if only he had exercised some prudence, instead of bragging.



## CROSS-PROFESSIONAL SKILLS



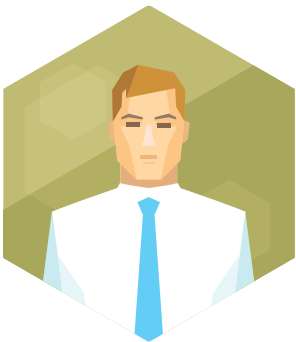


# CROWD FUNDING AND CROWD INVESTING PLATFORM MANAGER

Specialist organizing the operation of crowd funding platforms, performing a preliminary evaluation of projects to receive crowd funding, and resolving conflicts between investors and project owners. In Russia, the required set of skills has not yet developed into a new profession, while western managers, advisors and marketing experts specializing in crowd funding projects are already actively offering their services.



## CROSS-PROFESSIONAL SKILLS



# PERSONAL PENSION PLAN DESIGNER ПЛАНОВ

Specialist for the development of models for personal investment in pension funds and other financial instruments, depending on income, job, lifestyle, and senior age expectations.



## CROSS-PROFESSIONAL SKILLS





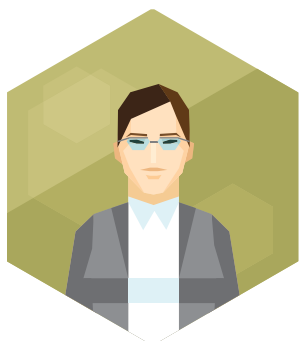


# MULTICURRENCY TRANSLATOR

Professional who organizes traditional, merit and alternative currency exchange systems. Online services exist already, where you can exchange bitcoins for Webmoney or transfer them to a common bank account in your own currency (e.g. 24change.com or alfacashier.com). Governments are still wary of these types of financial transactions, as unconventional money flows are harder to control. The process, however, is in full swing now: according to 2014 data, global bitcoin turnover was evaluated at roughly \$11 billion, with the first virtual currency ATMs having appeared already.



## CROSS-PROFESSIONAL SKILLS



# DIRECT TALENT INVESTMENT FUND MANAGER

Specialist engaged in building "portfolios" of talented professionals, supporting their educational and career pathways to maximize their income and, consequently, the income of the fund (taking after the agents of movie stars and young athletes).



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- National Research University – Higher School of Economics (HSE)
- Plekhanov Russian University of Economic
- Financial University under the Government of the Russian Federation
- The Russian Presidential Academy of National Economy and Public Administration (RANEPA)
- St. Petersburg State University
- Moscow State University of Economics, Statistics and Informatics

Nearly every Russian university teaches economic and financial specialties, although in most of them the quality of training leaves much to be desired. The specialty of “financial worker” was in demand in the 1990s and 2000s. However, there has been an “overtraining” in the profession, and if you are not a holder of a certificate issued by a leading university, you will have a difficult time finding a job.

## FINANCIAL SECTOR EMPLOYERS IN THE RUSSIAN FEDERATION

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There are scores of companies operating in the financial and investment sector, and many of them are quite large Russian and international companies.

### BANKS

- SBERBANK
- VTB
- GAZPROMBANK
- VTB 24
- Russian Agricultural Bank
- Bank of Moscow

### INVESTMENT FUNDS

- Gazprombank Mutual Fund
- TKB BNP Pariba Investment Partners
- VTB Mutual Fund

### MAJOR INSURANCE COMPANIES:

- Rosgosstrakh
- Sogaz
- Ingosstrakh
- RESO-Garantia
- Leading pension funds
- LUKOIL-GARANT Non-Governmental Pension Fund
- BLAGOSOSTOYANIE
- Sberbank Non-Governmental Pension Fund
- GAZFOND

### LEADING PENSION FUNDS:

- LUKOIL-GARANT Non-Governmental Pension Fund
- BLAGOSOSTOYANIE
- Sberbank Non-Governmental Pension Fund
- GAZFOND



2017  
2016  
2015  
2014  
2013



# MANAGEMENT

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## HOW IS THE INDUSTRY CHANGING?

Management is not a separate sector in itself, but professional managers are present in all sectors of the economy. Many management specialties are metasectoral, which means that professional managers can freely switch between sectors. In the future, all production processes will grow in complexity, thereby increasing demand for employees with good organizational skills. On the other hand, the automation of solutions has made a revolution in the management field. In the future, its main objective will be to find distributed management mechanisms, i.e. the capabilities of setting up and coordinating distributed and mobile teams of professionals for specific projects. More and more specialists will work remotely and part-time, investing their time and effort in several concurrent projects. Aside from that, changes in the society and in consumption habits will happen so fast that management teams will need to continuously analyze new trends.

Whereas in the past, a standard management system had the appearance of a pyramid with multiple levels of middle management, today, connections between employees are becoming increasingly horizontal, with employees gaining greater

independence in decision making, while some firms are even experimenting with supervisor-free models. For example, in the U.S.-based Valve, the publisher of popular computer games such as Portal, Half-Life, Counter-Strike and Team Fortress, all 400 employees enjoy equal authority. They team up for particular projects at their discretion, without centralized management.

In the future, the key objective of management will be to find distributed management mechanisms, i.e. the capabilities of setting up and coordinating distributed and mobile teams of professionals for specific projects. More and more specialists will work remotely and part-time, investing their time and effort in several concurrent projects. Aside from that, changes in the society and in consumption habits will happen so fast that management teams will need to continuously analyze new trends.

In the 2020s, hierarchical organizations (e.g. independent producers' communities) will play a bigger part, coordinating their sales and production plans via networks, as well as investments in equipment and human capital.

**POSSIBLE FUTURE CHALLENGES:**

- Managing people's time
- Creating and managing distributed communities
- Practical community development
- Moderating online communities
- Shaping personal images
- Shaping personal financial trajectories
- Supporting cross-cultural communication
- Dealing with the "image of the future"

CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



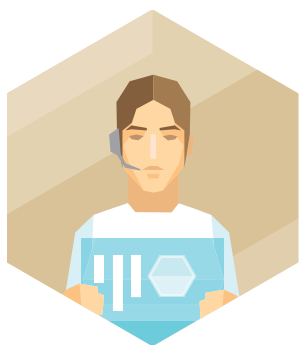
Lean production



Artistic skills



Environmental thinking



# TIME BROKER

Specialist “trading” in the working hours of freelancer specialists, i.e. managing people’s employment in the open market. The job will disappear in a longer-term perspective, due to the emergence of automated solutions. Technological advance is eliminating the need for permanent presence in an office. Moreover, a specialist with linguistic skills can even serve clients in foreign countries. At the same time, both freelancers and employers are lacking intermediaries, as recruiting agencies are still focused on full-time vacancies, while contractor search websites (such as Freelancer.ru) are not very convenient. Therefore, demand for time brokers will grow in the near future.



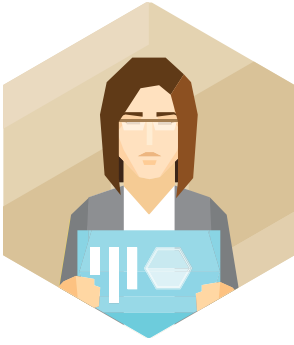
## CONVERSATION BETWEEN A TIME BROKER AND A CUSTOMER

- 13:56 TIMEHUNTER:**  
If I understand correctly, you need an experienced virtual reality designer, right? I have already checked four matching specialists for you. Do you have any specific requirements?
- 13:58 BIGBROTHER:**  
The successful candidate should be good with the sounds, smells and fine motor skills of wild animals. The perfect candidate should be experienced in creating jungle environments.
- 14:02 TIMEHUNTER:**  
I think your perfect match would be Stefan Kispest. He is the one who created the legendary game Akela. He also designed virtual halls for the London Natural History Museum. However, he is only available for five hours a day, three days a week. And he is rather expensive, at \$500 an hour. But he is worth the money. Trust me. Does that suit you?
- 14:03 BIGBROTHER:**  
Can we add at least three hours? We are running late with our project and I'm afraid we won't be able to finish on time with the proposed schedule. On our part, we could increase his pay to \$600.
- 14:02 TIMEHUNTER:**  
Alright, I'll discuss it with him at 9 p.m. and let you know.
- 14:03 BIGBROTHER:**  
Agreed.



## CROSS-PROFESSIONAL SKILLS



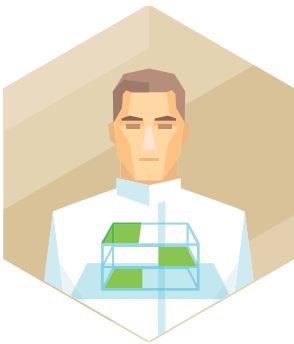


# TIME MANAGER

Specialist in the efficient use and allocation of personal and team time. This specialist is mainly tasked with optimizing time allocation in order to absorb the emerging technological opportunities and needs of a person or a team.



## CROSS-PROFESSIONAL SKILLS



# ENVIRONMENT AUDITOR

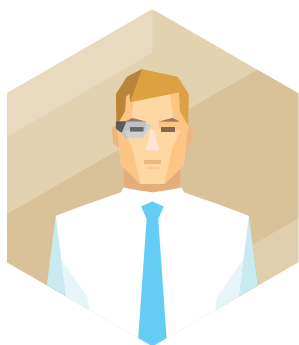
Professional engaged in the audit of industrial facilities and providing recommendations on ways to reduce the environmental footprint through industrial upgrades or by changing operating practices and methods. This is a relevant and quite an old job existing in Russia since 1993. In 2005, the National Environmental Audit Chamber was established to carry out independent environmental audits, issue accreditations to environmental audit firms, and train environmental auditors. However, the practically non-existent legal framework and the non-transparent environmental policies of businesses do not encourage experience sharing between specialists and are holding back the sector's development. Nevertheless, demand for these specialists is increasing.



## CROSS-PROFESSIONAL SKILLS





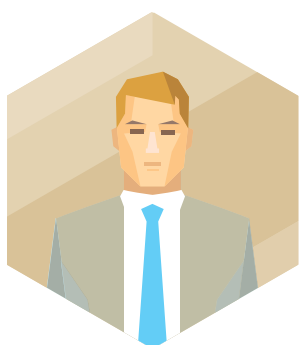


## TREND WATCHER / FORESIGHTER

Specialist in tracking the emergence of new trends in various branches of the economy, social life, politics, and culture, preparing reports on the influence of new trends on customer needs. In a long-term perspective, the ability to work with “images of the future” will become a versatile competency for any manager.



CROSS-PROFESSIONAL SKILLS

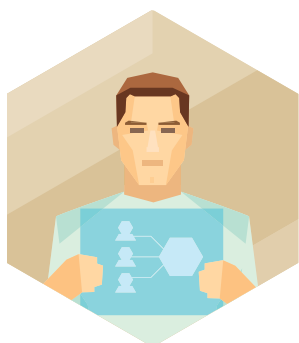


## VIRTUAL LAWYER

Specialist in remote legal support via the Internet, including advice on the statutory norms of the country in which a business is to operate (regardless of the lawyer's country of operation).



CROSS-PROFESSIONAL SKILLS



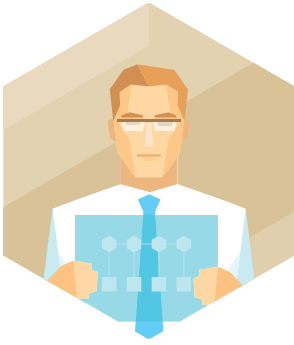
## USER COMMUNITY MODERATOR

Professional tasked with organizing online user communities, supporting the dialogue with company product designers to develop a product line, and maintaining their loyalty (e.g. arranging contests, etc.).



CROSS-PROFESSIONAL SKILLS





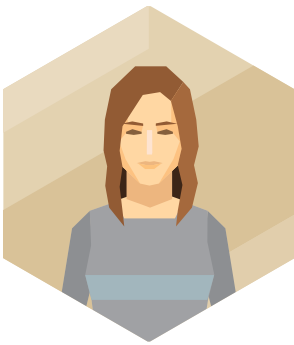
# CORPORATE VENTURE FUND PORTFOLIO MANAGER

Professional who manages a company's investments in startups created on the basis of the ideas of its employees and aimed at developing the company's product line. Supports the growth of such startups, from conception to the production stage. Corporate venture funds constantly search for new promising solutions. For example, in 2011, Google Ventures launched a special programme for its employees: in exchange for information about viable startups, the company was prepared to pay a bonus of \$10,000.

job  
to emerge  
before 2020

to  
20 y.

CROSS-PROFESSIONAL SKILLS



# CORPORATE ANTHROPOLOGIST

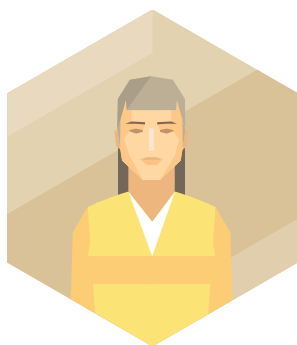
Specialist engaged in studying the markets of a company's innovative products using anthropological methods (e.g. overt observation), and enhancing connection between the company and its target audience. In the West, employment in the business domain has long been regarded as a logical development of an anthropologist's career, ever since the consumption of products and services began to be studied in sociocultural and economic contexts. Relevant specialists are hired mostly by IT companies, including Intel and Nokia.

job  
to emerge  
before 2020

to  
20 y.

CROSS-PROFESSIONAL SKILLS





## CROSS-CULTURAL COMMUNICATION MANAGER

Professional maintaining a company's document flow in foreign languages, controlling key messages (e.g. in selecting marketing slogans), training employees in expressing their messages in foreign languages, as well as in cultural specifics in negotiations with foreign partners. Advises company management on doing business in foreign countries. The lack of specialists able to resolve translation difficulties has been the reason of unsuccessful transactions, as well as advertising campaign failures. For example, when translated into Chinese in the 1980s, KFC's corporate slogan, *Finger-lickin' good*, came out as *We will bite off your fingers*, which, obviously, did not help the American fast food chain gain popularity with the locals.



### CROSS-PROFESSIONAL SKILLS



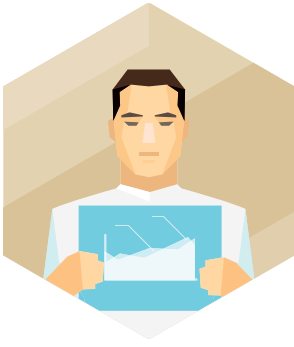
## PERSONAL BRAND MANAGER

Specialist engaged in shaping a personal image using social networks and other public platforms in accordance with the customer's goals and requirements. Building a personal brand is an important aspect of modern business coaching. An image tailored to a specific target audience can help a person stand out among other specialists and become a leader of public opinion in his niche. This boosts demand for the service.



### CROSS-PROFESSIONAL SKILLS



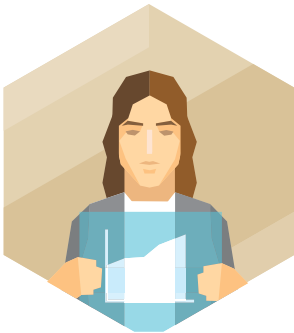


# ONLINE SALES MANAGER

Specialist who works in offline companies, develops Internet-based promotion mechanisms for products, organizes marketing campaigns on the Internet, supports own online stores, or works with partners to improve service for customers (e.g. promptness of delivery). The specialty can already be considered developed in Russia, with 260 vacancies published in July 2014, according to Career.ru. Still, demand for the profession is expected to grow.



## CROSS-PROFESSIONAL SKILLS



# INDIVIDUAL FINANCIAL TRAJECTORY DESIGNER

Professional in calculating personal investment models based on projected income and expenses, providing recommendations for planning family and personal budgets, career development, etc. The job of personal financial advisor already exists on the Russian market, but, considering the fact that increasingly more specialists will work part-time and be able to run several concurrent projects (including in foreign countries), income sources may become more diversified, and professional advice will be needed more often.



## CROSS-PROFESSIONAL SKILLS



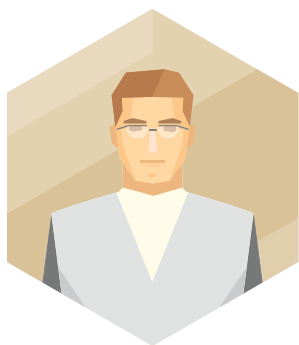


# PRODUCTION COORDINATOR IN DISTRIBUTED COMMUNITIES

Professional who consolidates an order and manages the activities of independent teams working within an industry community, to design, manufacture, and assemble a product to the client's requirements.



## CROSS-PROFESSIONAL SKILLS



# COMMUNITY DEVELOPMENT PLAN COORDINATOR

Professional engaged in organizing and supporting a dialogue between independent teams of producers, aligning their long-term goals with the common image of the future, and helping them define a programme of joint investments in production facilities and human resources. This represents a new level of project management. Future managers will have to coordinate the activities of project teams whose members are located in different countries.



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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Many universities train specialists in management and marketing, although the quality of training in most of them is very low. Comparatively good training programmes are taught in economic schools, such as:

- National Research University – Higher School of Economics (HSE)
- Plekhanov Russian University of Economic
- The Russian Presidential Academy of National Economy and Public Administration (RANEPA)
- State University of Management
- Lomonosov Moscow State University

As a rule, management and sales competencies develop when working in a specific industry. This is why people who want to have a successful career in management should start with industry-specific technical education or general education in leading economic or technical schools. Management training generally means training for adults who have at least five to ten years of experience, including working in managerial positions. Leading Russian and global business schools will help you enhance your management skills and acquire structured knowledge in this field. The leading Russian business schools are:

- Moscow Management School SKOLKOVO
- Lomonosov MSU Business School
- Higher School of Management under Higher School of Economics
- Higher School of Management under Saint Petersburg State University
- Institute of Business Studies (IBS) under RANEPA

## MANAGEMENT EMPLOYERS IN THE RUSSIAN FEDERATION

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Management competencies are required in all large, medium and small businesses, in government and municipal administration, as well as public movements and organizations. It should be noted that with the emergence of automated management systems, the structure of job tasks for specialists is beginning to change in the sector.

There are special-purpose companies providing management consulting and external (including crisis) management services. These are mostly international companies, though a few Russian players have appeared in recent years.

- ◆ PricewaterhouseCoopers
- ◆ Ernst&Young
- ◆ The Boston Consulting Group
- ◆ McKinsey&Co
- ◆ Business Systems Development (RBS)
- ◆ Strategy Partners Group



СФОРМИРОВАТЬ ОТЧЕТ  
И ОТПРАВИТЬ В ЖЭК

Оформить заявку

Оформить заявку

Оформить заявку

Получить отчет  
и отправить в ЖЭК



# SOCIAL SECTOR

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## Natalia Ushakova

Vice President, Russian Public Organization of Small and Medium Business Support of Russia; President, Independent Non-Profit Organization National Centre for Research and Development in Healthcare and Social Sector Support of Health; Vice President, Non-Profit Partnership National Chamber of Medicine

The economy of the future will be more focused on the mass consumer, on personal tastes, preferences and expectations. At the same time, economic changes will still be driven by the requirement to provide for traditional basic human needs, most often online and fueled by information and automation technologies. Knowledge, practical skills and expertise in these areas, along with proficiency in languages, will form the basis for job competencies and relevant qualification requirements for experts and workers engaged in innovative industries.

## HOW IS THE INDUSTRY CHANGING?

The traditionally conservative sector of public and social services has undergone profound transformations with the advancement of information technology. However, this is just the beginning of a long journey.

First of all, the services are becoming more transparent. One can report a problem (e.g. a bad road or lack of street lighting) in a public online space and get a report on its solution at the same place. Users can also track the progress of a reform and post their comments.

Secondly, citizens are provided an opportunity to become involved in the administration of regions and territories and participate in tackling specific social issues. This includes initiatives coming from authorities, as well as independent

organizations of people willing to implement an idea, e.g. the volunteer project Lisa Alert to find missing people, or Brother for Sister, a volunteer movement of men walking women home after dark. Problem solving has also become more targeted, with the possibility of providing aid to a particular disabled person or economically disadvantaged family.

Finally, society is altering its approach to people with disabilities, with information technology enabling the latter to be fully involved in social activities. For example, blind and visually impaired people can work and communicate on the Internet using special software and Braille displays, while people with limited mobility can imagine themselves dancing with the help of the Oculus Rift virtual reality headset.

**POSSIBLE FUTURE CHALLENGES:**

- Organizing and managing online communities focused on social issues
- Migrant adaptation
- Integrating people with disabilities into active life via the Internet
- Organizing targeted charity
- Organizing social entrepreneurship activities

CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



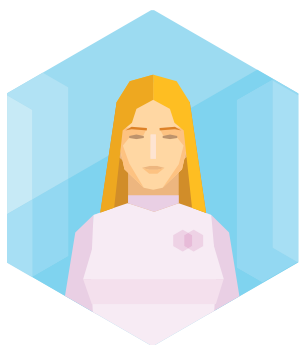
Lean production



Artistic skills



Environmental thinking



# GOVERNMENT AUTHORITY COMMUNICATION PLATFORM MODERATOR

Specialist in organizing online and offline dialogue between public activists and government officials responsible for particular areas (e.g. education, utilities, construction, pensions, etc.) in order to develop solutions together.



CROSS-PROFESSIONAL SKILLS

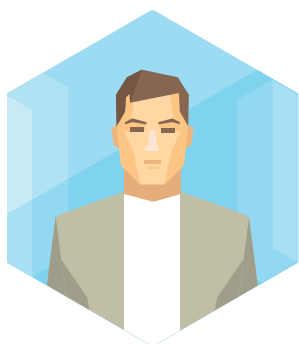


# MIGRANT ADAPTATION SPECIALIST

Professional engaged in teaching national language and culture, including via online platforms. Russian language schools for migrants are already opening in Moscow and Saint Petersburg, including those for their children, functioning within ordinary schools. The government promised to open the first online school for foreigners in 2015.



CROSS-PROFESSIONAL SKILLS



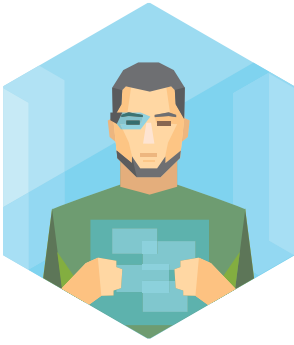
# SOCIAL CONFLICT MEDIATOR

Specialist in assisting in the peaceful resolution of conflicts arising between social groups due to property-related, cultural, national, religious, and other reasons.



CROSS-PROFESSIONAL SKILLS





# SOCIAL WORKER FOR DISABLED PERSONS ADAPTATION USING INTERNET TECHNOLOGY

Specialist who helps people with disabilities lead a full life by training them in skills required for remote employment, helping them select a job, and organizing their work and leisure (e.g. by finding relevant online communities, communication platforms, training courses, etc.).



## DAILY PLANNER

### 9/09

**12.30**

See P.L. to help him set up his Braille display and text-to-speech software. Recommend relevant forums on legal subjects.

**14.30**

Get in touch with N.K. to consult her on distant learning options at MSU. Before that, check info on the new master's department at the Social Sciences Faculty.

Evening: compile a list of communication platforms for S.V. according to his requests (books, films, social and political discussions).

### 10/09

**10.50**

Help D.E. figure out homework for Coursera (Game Theory course). Recommend a good Skype math teacher.

job  
to emerge  
before 2020



## CROSS-PROFESSIONAL SKILLS



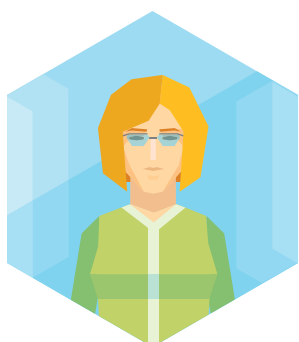


## PERSONAL CHARITY PLATFORM MODERATOR

Compiles personal request files (e.g. children with cancer or lonely elderly people) and links people seeking help with charity givers, who provide aid in various forms (money, in-kind contributions, keeping company, etc.). For example, the popular blogger, doctor and philanthropist Elizaveta Glinka (aka Doctor Lisa) posts on her Livejournal reports of her own Fair Aid fund, as well as information about other projects and people in need of help.



### CROSS-PROFESSIONAL SKILLS



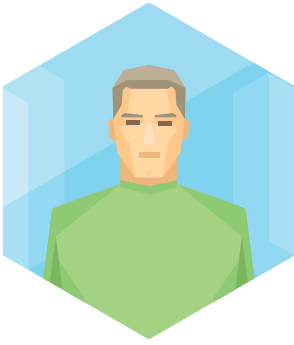
## STATE-PRIVATE PARTNERSHIP SPECIALIST FOR THE SOCIAL SECTOR

Helps contract the government's functions in the social sector (e.g. building and premises cleaning, water supply and heating, energy saving, solid waste recycling, building and utilities repairs, municipal transport, kindergartens, etc.) to social entrepreneurs, who arrange the provision of these services in the form of state-private partnerships.



### CROSS-PROFESSIONAL SKILLS





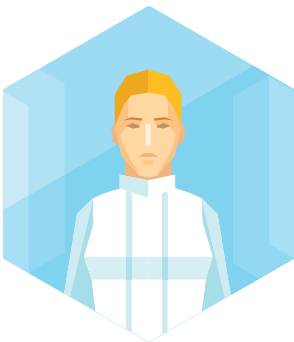
# CROWD SOURCING EXPERT FOR SOCIAL ISSUES

Manages a crowd sourcing platform to collect information on problems in families, households, districts, roads, parks, and other public spaces, etc., and relays such requests to government authorities or non-profit organizations, while tracking their execution. For example, Russia has had the Democrator initiative for several years now. The project is an electronic platform for communication between citizens and authorities, organizations, parties and social movements. The service is moderated by a team of professional lawyers helping users file official requests to various agencies and achieve results.

job  
to emerge  
before 2020

to  
20 y.

CROSS-PROFESSIONAL SKILLS



# ENVIRONMENTAL COUNSELOR

Specialist in providing support to community groups working to improve the environmental situation, by arranging information exchange between them and helping them establish supervision over industrial production and monitor the activities of local authorities in cities and/or villages. Many people generally wish to participate in some kind of environmental activity, though they often lack an organizer who would tell them what to do and where. Some environmental activists are already gathering people into volunteer groups, but the area will need more specialists in the future.

job  
to emerge  
after 2020

after  
20 y.

CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- National Research University – Higher School of Economics (HSE)
- The Russian Presidential Academy of National Economy and Public Administration (RANEPA)
- Lomonosov Moscow State University
- Moscow University of Psychology and Social Sciences (MPSU)
- Russian State Social University (RGSU)
- Moscow Institute of Social and Economic Sciences (MSEI)

Many universities have their own faculties of public service and administration. As in the case with manager professions, we recommend combining it with fundamental training or technical education.





# ART AND CULTURE

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## HOW IS THE INDUSTRY CHANGING?

Culture is one of the oldest spheres of human activity, though it has gradually become a prerogative of a tight circle of professionals. However, with routine operations performed by machines, more and more people will engage in creative activities and produce their own works of art. This change will be driven by the affordability of graphic technologies (special photo filters for iPhone allow creating artistic photos in real time, and Garage Band software can replace a recording studio), as well as by the fuzziness of artistic criteria. On one hand, this is a good trend, because in the 21st century, a talented author can find an audience easier than ever. On the other hand, it is hard not to get lost in the enormous stream of creative products, and even harder to define art as such. A need arises for individual media filters to help the user to avoid being drowned by streams of data. In addition, a connoisseur may require personalized search algorithms and tutors to

help him/her build their own trajectory of aesthetic perception and cognition.

Technological progress may bring humankind to new levels of art perception and creativity. We will be able to create complicated artistic objects using 3D printers, robots and neural interfaces, as well as to learn to better control our artistic states. The expanding virtual space is enabling some artists to move entirely to digital worlds, creating new and unexpected forms. For example, employees of Blizzard Entertainment have started their own metal band in World of Warcraft. Players can visit its concerts in respective localities, or, subject to obtaining certain artifacts, turn into a guitarist of the band for 12 seconds.

We are now witnessing a withdrawal from traditional ways of how art engages the spectator, with interactive formats used more and more often. Already, there are interactive books for iPad. Immersive theater

is also gaining popularity, erasing the division between the stage and the auditorium, with the spectator involved in the act to the fullest possible degree. The most remarkable example is the British theater PunchDrunk with more than 20 conspicuous projects, including *Sleep No More*, based on the works of Shakespeare and Hitchcock. Before the performance, the different scenes of which take place in 44 rooms on 4 floors, spectators are required to put on white masks and then choose the order in which to travel through the performance.

The mutual penetration of art and other fields produces interesting combinations, such as Science Art, a type of modern art where artists use scientific achievements and, quite often, are scientists themselves. Art is beginning to play a significant part in education as well. Art universities may

appear where students will learn through various forms of art as well as other methods.

Different art strategies and technologies are fusing into curious forms of cooperation. Art is becoming more collective, with artwork turning into a complex project involving – aside the artist – managers, software developers, engineers, etc. In addition, the need for co-creation is generating demand for dedicated social networks for artistic people. Demand is also rising for participatory art, where the artist only issues instructions, and exhibition visitors use them to create artistic works themselves. For example, the interactive exhibition *do it*, based on this principle, has been treading the world for as long as 20 years. The Garage Museum of Contemporary Art hosted the exhibition in summer 2014.

**POSSIBLE FUTURE CHALLENGES:**

- Creating new synthetic art forms using the latest scientific and technological achievements
- Creating a new classification and criteria for appraising works of art
- Managing altered states of consciousness relevant for both the creative process and art perception
- Creating artistic images in virtual space
- Devirtualization, i.e. psychological return to reality from virtual space (virtualization and devirtualization are concurrent processes following different trajectories)
- Creating individual trajectories of interaction with works of art, tailored to a particular user

## CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



Lean production



Artistic skills



Environmental thinking



# COLLECTIVE ART SUPERVISOR

Sets up artistic teams for specific creative projects. These teams may include artists of various specializations, scientists, software developers, engineers, and professionals from other fields.



## CROSS-PROFESSIONAL SKILLS



# CREATIVE STATE TRAINER

Mind fitness expert engaged in helping art workers enter the flow state, as well as other states characterized by increased creativity. The trainer is also engaged in developing awareness, because one of the most important challenges for an artist is the continuous reflection on reality.



## CROSS-PROFESSIONAL SKILLS





# PERSONAL AESTHETIC DEVELOPMENT TUTOR

This professional builds individual trajectories of interaction with works of art for the user. He/she possesses an excellent knowledge of the cultural environment and draws up an aesthetic development programmes in accordance with the tastes, needs and opportunities of the client, e.g. to track the development of various aspects of Gothic art from the Middle Ages to the present time, in the fields of architecture, design, literature, music, and cinema.



## LETTER TO A CLIENT FROM A PERSONAL AESTHETIC DEVELOPMENT TUTOR

To: *Mikhail [misha.tt@supermail.ru]*

From: *Me [tutor.ex@estetica.org]*

Subj: *re: Analysis*

Dear Mikhail,

I have analyzed your current aesthetic interests, free time and travel plans for the coming three months, and would like to suggest the following programme on surrealism:

**Books:** Froth on the Daydream by Boris Vian, Diary of a Genius by Salvador Dali, Magnetic Fields poem, World Art. Surrealism by Ivan Mosin, Magritte by Marcel Paquet.

**Video collections:** Course Introduction to Art: Concepts & Techniques at Coursera

**Films:** René Claire's Entr'acte, Salvador Dali's cartoon Destino, David Lynch's films

**Fantastic realism:** Hans Rudolf Giger and Jacek Yerka

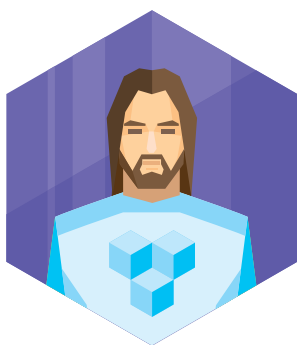
**Modern neo-surrealism:** George Grie

**Ongoing exhibitions:** a large exhibition of Magritte's works will be held in Paris, and Giger's works will be brought to Moscow in February.



## CROSS-PROFESSIONAL SKILLS



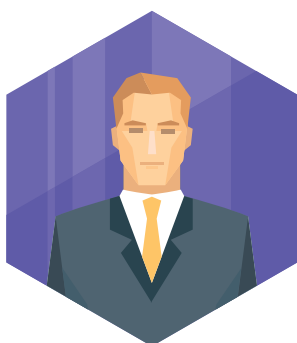


# SCIENCE ARTIST

Applies scientific data and knowledge in creative work. Science art is not only practiced by individual artists, but is also supported by prominent educational institutions. For example, MIT has its own Center for Science, Art and Technology, while the New York School of Visual Arts launched a bio-art curriculum last year.



CROSS-PROFESSIONAL SKILLS



# ART APPRAISER

Specialist able to appraise new forms of artistic works consisting of heterogeneous elements and noted for their complexity and/or fragility (e.g. science art, street art or performance).



CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Moscow State University of Culture and Arts
- British Higher School of Art and Design (Modern Art curriculum)
- Rodchenko Moscow School of Photography and Multimedia (Photography and Multimedia curriculum)
- Moscow State Stroganov Academy of Industrial and Applied Arts
- Russian State University for the Humanities (History of Art Faculty)
- Russian State Specialized Academy of Arts
- Russian State University of Cinematography (VGIK)
- Saint Petersburg State University of Culture and Arts (Faculty of Arts, Faculty of World Culture)
- Smolny Faculty of Liberal Arts and Sciences





# MEDIA AND ENTERTAINMENT

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## Anatoly Prokhorov

Russian film and TV producer, founder of Pilot studio, co-organizer of the Russian Internet Academy

The following qualities of future professionals will be the most valued by their employers and colleagues: near instantaneous insight into the structure of a problem and possible solutions; readiness and ability to change one's job once every several years; fast learning. The following qualities will be valued by a professional himself: changing from a project-based approach to a team-based one; ability to see and build a career path within the context of his life, and his life within the context of forming his own worldview.

## HOW IS THE INDUSTRY CHANGING?

In the 20<sup>th</sup> century, mass media became a principal means of communications and its objective was to provide people with as much information as possible on what is going on in the world. In the current 21<sup>st</sup> century, this role is changing, entailing the need to restrict information streams. Responding to this need, media resources are gradually turning from unique news sources into powerful filters, highlighting important messages and helping one become familiar with the agenda.

Even now, a user can set up a feed to read certain pages, or filter information on social networks using special add-ons. However, the convenience of such settings still leaves much to be desired. In the future, users will be able to create their own information streams and define their editing principles. Media software, such as search engines, information sorters and processors capable of creating customized information packages for users, will provide increasingly greater assistance in the sector. Moreover, computer services will develop for automatic translation, speech recognition, search, extraction, and sorting

and processing of data (e.g. transformation of source data into complete news pieces, infographics, or text notes). However, mass media will retain its role, as many users will use standard settings, not wanting to influence what they get.

The notions of information objectivity and expertness will grow blurry, as the number of sources is growing too fast, making it practically impossible to assess their quality. This is why ordinary users will start switching to a more competent use of information. Educational curriculums will even include courses on collecting, interpreting and using data. Articles and books with advice on this topic are already popular, with examples such as Clay Johnson's *The Information Diet*. The skill of verifying the quality of information will become part of basic literacy, on a par with reading or simple mathematics. Also, increasingly sophisticated software will be developed for verifying information and checking its sources.

The growing automation of the media sphere will take many journalistic functions

from people and entrust them to machines. For example, the Associated Press has already acquired a new robot for writing short texts containing corporate income statements. Professional journalists will continue their work in formats requiring significant creative talents, e.g. independent journalism.

There will be a massive introduction of new technologies for stimulating human perceptive organs (olfaction, tactile sensations, taste, sense of gravity). New information channels will allow media and entertainment to achieve even closer and more real contact with the consumer. These techniques are being developed already. In 2013, a Japanese film theater showed a smell-enhanced presentation of Terrence Malick's *The New World*, with scenes of grief and anger

accompanied by scents of tea and eucalyptus, joyous events by citrus, and romantic episodes by flowers. 4D technologies (which are more frequently applied in amusement rides than theaters) enable the viewer to feel wind, water sprays, real-life movement, or a change of body position. Neural interfaces immersing the user in a synthetic reality will produce a giant breakthrough.

Games will become a most prominent means of entertainment, from urban quests involving augmented reality to massive events in virtual spaces. A secondary economy will also develop in virtual worlds, influencing the real-world economy. Virtual currencies, weapons, and armour are already for sale for real money, e.g. in games like *World of Warcraft* or *Diablo 3*.

### POSSIBLE FUTURE CHALLENGES:

- Developing more sophisticated software for content search and filtering
- Creating specialized information feeds according to user needs
- Controlling the quality and security of information in the media space
- Designing worlds for virtual reality
- Developing new entertainment interfaces engaging different sensory organs (smell, touch, orientation, etc.)
- Personalized adjustment of digital agents, i.e. virtual characters to which a user can delegate certain routine functions

#### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



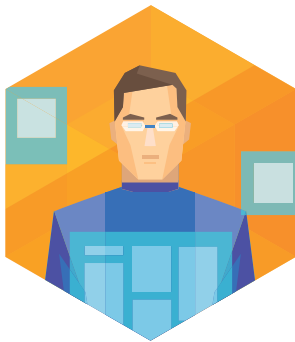
Lean production



Artistic skills



Environmental thinking



# CONTENT AGGREGATOR EDITOR

Manages information channels and selects content matching users' expectations by adjusting search engines, aggregators and processors of information. The profession already exists in digital media. However, demand for it will grow together with the expansion of individual mass media. Eventually, the specialty will turn into a versatile competency.



CROSS-PROFESSIONAL SKILLS



# INFO STYLIST

Professional who selects information and a manner of presentation to match the requirements of a particular user. Today, the stream of content is offered to a user as a selection of recommended information products, based on geotargeting, the user's search queries, or user interests which were specified in the user's social network profile. This is done mostly externally, by an algorithm that someone created for their own purposes. In the future, people wishing to generate such a stream for themselves and by themselves will create demand for similar algorithms, which they will make themselves or order from relevant specialists.



CROSS-PROFESSIONAL SKILLS



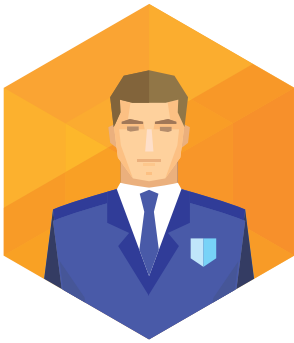


# MEDIA SOFTWARE DESIGNER

This specialist works in cooperation with psychologists, linguists and engineers to create software tools for finding, processing and distributing information on the Internet (search engines, semantic analyzers, aggregators, robots, writing).



## CROSS-PROFESSIONAL SKILLS



# MEDIA POLICEMAN

The media policeman is a law enforcer in the media sphere. Identifies transgressions by monitoring media resources personally and/or using special software. In Russia, this function is partly performed by Roskomnadzor (Federal Service for Supervision of Communications, Information Technology, and Mass Media) and the Safe Internet League. In the future, however, it will grow into a separate job due to increasing information abuse and cyber crime rates.



## CROSS-PROFESSIONAL SKILLS



# GAME PRACTITIONER

Organizer, creator of, and guide to, game universes in real and virtual spaces. Urban quests are now popular, from the Running City to games like Claustrophobia, designed for confined spaces. There are also alternate reality games (ARG), with very fuzzy boundaries between the real world and the game. Games like those will only spread in the future.



## CROSS-PROFESSIONAL SKILLS





# SEMANTIC FIELD PRODUCER

Responsible for shaping a general worldview according to which, the media streams he/she controls will be created. This specialist controls content selectors that generate information streams for users within a given worldview, and performs high-level tuning of media robots. (A similar function in society is performed by "culture sommeliers" from Victor Pelevin's *S.N.U.F.F.*).

job to emerge after 2020  
after 20 y.

CROSS-PROFESSIONAL SKILLS



# EMOTION DESIGNER

Creates an emotional background for content, using new information channels, including pathways directed into the user's brain. The designer controls the stimulation of sensory organs to create the necessary feelings and emotions of the user during content consumption.

job to emerge after 2020  
after 20 y.

CROSS-PROFESSIONAL SKILLS



# VIRTUAL REALITY ARCHITECT

Specialist in designing solutions for work, studies, and leisure in virtual reality. Develops software and hardware based on the biological and psychological parameters of the user (including custom orders).

job to emerge after 2020  
after 20 y.

CROSS-PROFESSIONAL SKILLS





# VIRTUAL WORLD DESIGNER

Creates concepts for virtual worlds: philosophy, laws of nature and society, social interaction and economic standards, landscape, architecture, sensations (including smells and sounds), animals, and a social world.



## WORKING CONVERSATION IN A VIRTUAL DESIGN FIRM

13:56 **ARCHI-VR:**

Andrey, the client is NASA, not some club of sci-fi geeks. Do you really think a sunset on Mars looks like this? What's up with those languid greenish hues? Take a look at the photos from Opportunity: it's clear blue. You have two days to get it right

13:58 **ANDREW:**

OK, although this variant seems more artful to me. By the way, I finished the ground, so steps will sound more realistic.

14:02 **ARCHI-VR:**

And do something with the gravity: the picture doesn't match when jumping

14:03 **ANDREW:**

I did it in the morning. Nadya is complaining. She has already sketched 20 stress situations for the second stage of colonist training, but we can't get the scenarios approved until we have consulted the psychologist. When are they going to send in the test results?

14:13 **ARCHI-VR:**

They say they had to replace a team member yesterday. His anxiety had gone over the top after a week of virtual walks.

job  
to emerge  
after 2020



## CROSS-PROFESSIONAL SKILLS



## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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To achieve successful fulfillment in most media and entertainment jobs of the future, a person will need the ability to handle information, tell interesting stories and be familiar with information technology. At present, with no special faculties, the best possible result can be achieved through a combination of training or experience in journalism (preferably multimedia), script writing, game design and programming.

- Higher School of Economics – Faculty of Communications, Media and Design (e.g. master’s program in Media Production in Creative Industries)
- Higher School of Economics – School of Business Informatics (Management of Online Game Projects)
- Scream School (Computer Games Development and Motion Design curriculums)
- Moscow School of New Cinema (Screen Writing and Producing faculties)
- Moscow State University
- MGIMO University (Faculty of International Journalism)
- Institute of Mass Media under Russian State University for the Humanities

Наибольшая длина	25
Расчетная длина	24,3
Наибольшая ширина	6,4
Высота борта на меделе	3,9
Осадка по КВЛ	2,0



Строительство верфи началось на левом берегу  
Большой Невы 5 ноября 1704 года





# TOURISM AND HOSPITALITY

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## HOW IS THE INDUSTRY CHANGING?

The Soviet Union had a fairly developed system of domestic tourism, supported by the closed nature of the country, but the situation has changed for the worse in the industry since 1991. On the other hand, a large segment of outbound tourism has emerged, enabling Russian people to see foreign countries. Modern hospitality practices began to appear only in the early 1990s, including high-quality hotels, restaurants offering good cuisine, entertainment clubs, and other services for tourists. Hospitality remains an industry with substantial growth potential, driven by both Russian travelers and foreign visitors. Growth opportunities exist, first of all, outside metropolises (Moscow and Saint Petersburg), in large industrial centres, small towns with a historical past, and natural preserves.

The development of transportation systems and increasing mobility allow travelers to reach their destinations faster and easier. This will pose new challenges for the tourism and hospitality sector, resulting from the growing number of tourists and their demands.

The sector is among the first to show a tendency for reducing the number of intermediaries between customers and services. This is why many mainstream services will gradually become simpler and automated, with integrated transportation systems and fare tickets, logistic tools for individual trips, automated control rooms for synchronizing individual public transport,

service robots, electronic guides and simultaneous interpreting devices. Many jobs in the segment will become endangered, with a significant share of business taken up by machines. Already, hotels are replacing their human employees with robots. For example, the Yotel hotel in New York has a special luggage-toting robot, while the staff of the Chinese Pengheng Space Capsules Hotel consists entirely of robots, from the doorkeepers to the waiters.

Since the diversity of choice will make tourists pickier, new travel formats will emerge, along with new capabilities of customizing leisure according to the client's physical shape, tastes and interests. Search services and applications for travelers will select relevant information based on the profile of a particular client. For example, they will promptly notify the client during a tour about newly opened flea markets or the arrival of a famous antique dealer, if the client is interested in vintage items. This essentially means that the job of a travel agent as we know it is becoming endangered, with respective functions to be performed by special software in the future. On the other hand, a need arises for personalized tours invented by people spiritually close to the client, in a peer-to-peer format.

With the advancement in virtual reality technology, one of the challenges facing the sector will be to compete for customers against the media and entertainment sector, since customers will be able to choose between a trip to the U.S.A. for a live rock

festival and VRMMORPG Woodstock. This will force the industry to extend the range of services to utilise this technology, so that tourists can go on sightseeing trips and shows involving augmented reality, games and re-enactments of historical events.

In the conditions of tough competition, clients' attention can only be captured and held by offering them a unique experience. This increases the importance of area branding, i.e. filling it with objects and game formats allowing tourists to participate in historical events or experience unparalleled emotions. Various aspects of impression tourism are already developing, including food and drink, agricultural, environmental

and spiritual tourism. The latter, being one of the oldest types of travel, is gaining a new life, owing to greater mobility. Demand will arise for unusual architectural objects in extreme areas, quick-to-build structures and "shimmering cities", i.e. temporary settlements where people are united by common interests to create a unique atmosphere and scenario. A bright example of an existing shimmering city is the Burning Man festival. For eight days a year, an entire tent city and exotic art objects spring up in the Black Rock Desert. Over 60,000 people came to live in the city in 2014. Russian equivalents are the Empty Hills and Archstoyanie festivals.

**POSSIBLE FUTURE CHALLENGES:**

- Creating online services for mapping and providing support for personal travel itineraries
- Promoting international service standards in hospitality and tourist entertainment
- Providing travel-related information in at least two languages, English and Chinese (including staff training, signboards, menus, etc.)
- Setting up centres for supporting event tourism with a framework for exchanging experience and devising new strategies
- Creating service centres for personal transport logistics
- Designing area brands and developing marketing strategies based on the unique advantages of a destination and customized approach to every tourist
- Creating techno- and eco-areas as material bases for businessmen (e.g. Nikola-Lenivets in Kaluga Region or Verkhnie Mandrogi in Leningrad Region, which became tourist centres and also clusters for the development of design, craft and small business in this sector)
- Ensuring security of travel programmes and related information
- Developing technologies for building quick-to-build structures and shimmering cities
- Organizing game events in tourist areas, including the use of virtual reality

## CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



Lean production



Artistic skills



Environmental thinking



# INDIVIDUAL TOUR DIRECTOR

Professional guide able to develop and personally conduct unique tours according to the requests of individual clients. In a way, the job already exists and will become mainstream as traditional travel operators disappear.



## CROSS-PROFESSIONAL SKILLS



# SPACE BRAND MANAGER

Advisor and responsible person for filling a virtual world with cultural content connected with a particular area. Creates the image and legend of a location, and adds design, identity, news, tourist services, and various events. All this makes the area unique, attracting visitors and turning it into a competitive tourist destination. The job already exists, and will grow in relevance as time goes on. Accordingly, requirements for specialists in this field will increase as well.



## CROSS-PROFESSIONAL SKILLS





# SMART TRAVEL SYSTEM DESIGNER

Specialist in creating automated ticket booking, navigation and hotel booking systems. Founders of travel agencies, such as AviaSales.Ru, are already capitalizing on the design of unique search algorithms. Demand for simple, convenient and cheap solutions in the area will only increase. In addition, more and more attention will be paid to the personalization and creation of individual itineraries.

job to emerge before 2025  
to 20 y.

CROSS-PROFESSIONAL SKILLS



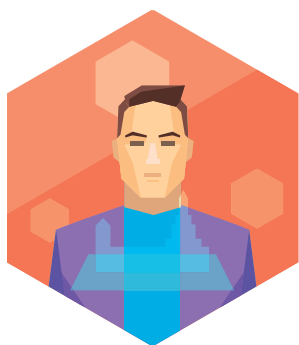
# TOUR NAVIGATOR DESIGNER

IT expert engaged in developing software and applications helping users find their way on a particular itinerary based on their interests, tastes, plans and ongoing cultural events.

job to emerge before 2025  
to 20 y.

CROSS-PROFESSIONAL SKILLS





# AUGMENTED REALITY AREA DESIGNER

Designs various layers of augmented reality around an area, taking into account its landscape, as well as historical and cultural context. For example, this specialist can create several options for Red Square: Ivan the Terrible era, 1917, stilyagi, etc. The designer will have to combine the skills of designer and programmer with good historical knowledge.



## SOCIAL DIARY

25/10

Got a fantastic job for the New Year! Radisson wants to restore the legendary Saigon in one of its bars at 49 Nevsky Avenue. They promise old-fashioned coffee dispensers and Alexander cakes. Naturally, I will be in charge of special effects and the atmosphere of that time. Time to dig into history.

03/11

Haven't gone out for two days, studying books on subculture fashions. Tomorrow I'm seeing Boris Grebenshchikov for his contribution into my collection of visitors' memories.

15/11

Not enough texture, need help! Looking for visitors of the former Saigon to check some details. Tea and pie are on me. Repost!

25/11

It's a shame Brodsky disliked the café. But I'm still thinking about a small holographic performance for him. Which poem would you like to hear? Please vote!

20/12

Well, almost everything is ready now. Designed an awesome quest based on Russian rock music: that's definitely nothing like looking for the missing Snow Maiden. If you still have no VR headset, don't worry: you can rent one at the entrance.

24/12

By the way, my project mates recreated the famous KGB mirror! There will be a separate compartment with a mirror with a concealed camera having a face recognition feature. All snapshots will be immediately uploaded to Instagram: back\_to\_saigon. Would be a good idea to find myself a hippie outfit.



## CROSS-PROFESSIONAL SKILLS



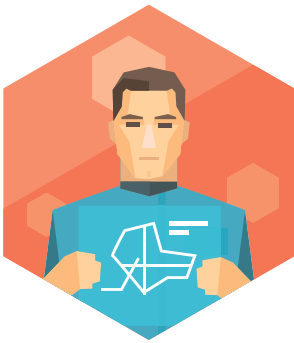


# ROBOT ATTENDANT

Specialist in managing hotel robots. Hotels already use robots in the U.S.A., China, Japan and other countries. Although mechanical doorkeepers, housekeepers and couriers have been doing a good job, a human is still needed to look after them. Such an attendant should be a highly organized specialist with multitasking skills, familiar with mechanics, and have experience in dealing with artificial intelligence.



## CROSS-PROFESSIONAL SKILLS



# TERRITORY ARCHITECT

Specialist tasked with creating "information landscapes" for tourists, taking into account the realities of the region, types of consumers, and currently popular trends in the travel industry. Whereas a brand manager performs the function of a creative director, a territory architect is a designer looking for specific and detailed solutions for particular tasks.



## CROSS-PROFESSIONAL SKILLS





## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Financial University Under the Government of the Russian Federation (Faculty of International Economic Relations, Tourism branch)
- Institute of Hospitality Business and Tourism at People's Friendship University of Russia
- Plekhanov Russian University of Economics (Higher School of Hotel, Tourism and Sport Industry)
- Senkevich Moscow State Institute of Tourism Industry (Faculty of Tourism and Hospitality)
- RSUH Institute for Economics, Management and Law (Tourism branch)
- Higher School of Branding
- Specialist Center at Bauman Moscow State Technical University (Event Management course)
- Moscow State University of Culture and Arts (Faculty of Social and Cultural Activity)
- St. Petersburg Academic University of Management and Economics (Tourism branch)
- Novosibirsk State University of Economics and Management (Social and Cultural Services and Tourism)



# SECURITY

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## HOW IS THE INDUSTRY CHANGING?

Before the 1990s, security matters had been taken care of either by citizens or the government. After the 1990s, the sector developed a segment of private services that began to grow rapidly. In this section, we focus specifically on that segment, not considering national and military security and protection of citizens from crime.

Human life is becoming ever more comfortable and long-lasting. However, new threats are emerging, such as man-made and environmental disasters, new types of weapons, and cyber attacks. This raises the topicality of security issues. Advancement in information technology will lead to enhanced capabilities in security and personal protection, bringing about changes in security standards in virtual worlds as well as in real life. Fewer and fewer security functions will be entrusted to humans, while more will be entrusted to smart systems of monitoring, analysis and automatic control.

Advanced security systems will require new methods of legislative control, professional standards, and technical regulations. More independent companies will appear with large numbers of specialists qualified in risk management. Demand will emerge for services to assess and design personal security in various conditions. For example, a person will be able to consult a security specialist before going to a jungle or a metropolis with high crime rates.

In the increasingly complex and volatile world, various personal security devices will gain wide acceptance. For example, there are already bicycle helmets with sensors able to respond to an accident and send a signal to the emergency ward, jackets with built-in radio stations and GPS navigators for mountain climbers and micro pepper-spray cans for iPhones. Also, technical means will be designed to enhance the professional capabilities of security service specialists, such as sandals with extendable flippers for beach lifeguards, or exoskeletons for firefighters. Moreover, people will receive help from robots, such as the swimming robot Seascout that can track a drowning person by GPS.

In the distant future, security systems will become proactive, eliminating the potential causes of emergency before it happens. For example, a special system will analyze street camera footage in real time and recognize the signs of unlawful actions. In 2014, Knightscope produced robots for patrolling city streets. They are programmed to notice unusual behavior of people and vehicles and notify the control centre accordingly. They are equipped with sensors to recognize smells and measure temperature. In addition, they can memorize up to 300 license plates in a minute, thereby contributing to traffic control. In the future, they will help minimize violations in the physical world, while surveillance systems will promptly identify any offender.

At the same time, the development of artificial intelligence and the ubiquitous application of automated control systems may lead to those systems becoming too complicated for a human being to understand, or to users becoming excessively dependent on them. This, in turn,

may pose a serious threat if a programme malfunctions or decides to act on its own. This is why in the future, the development of security systems will involve designing means of protection against AI malfunction and alternative rescue plans if computers become impossible to use.

### POSSIBLE FUTURE CHALLENGES:

- Developing, manufacturing, implementing and maintaining advanced security systems
- Shaping a culture of security (personal, industrial, urban, etc.)
- Administering IT security systems (alarm, control, access and monitoring systems)
- Comprehensive risk assessment
- Protecting IT infrastructures (smart home, "lights-out" factory, etc.)
- Protecting personal and occupational space equipped with smart devices
- Reducing the vulnerability of technical equipment to external threats (man-made disasters, electromagnetic radiation, etc.)
- Promoting industrial information security (security at the intersection of physical and virtual infrastructure, e.g. factory management systems)

#### CROSS-PROFESSIONAL SKILLS



Systems thinking



Intersectoral communication



Project management



Programming / Robotics / Artificial Intelligence



Client focus



Multilingual and multicultural abilities



Interpersonal skills



Ability to work under uncertainty



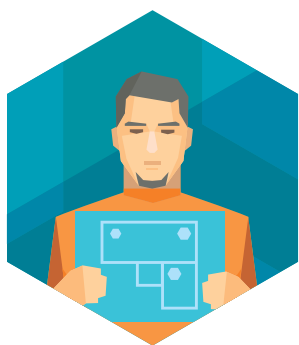
Lean production



Artistic skills



Environmental thinking

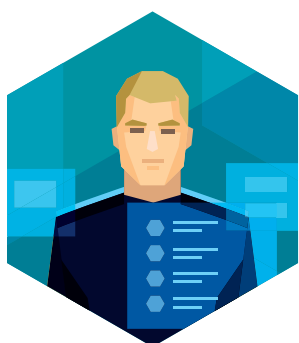


# INTEGRATED INDUSTRIAL SECURITY AUDITOR

Specialist in assessing the state of security at an existing facility and monitoring all types of threats such as mechanical damage, fire, environmental threats, cyber attacks, etc.



CROSS-PROFESSIONAL SKILLS



# REMOTE SECURITY COORDINATOR

Operator of advanced automated robotic security systems. Responsible for monitoring their condition via sensors and surveillance cameras and dispatching an immediate response team to a facility if needed. The occupation is an evolution of the security guard job and will be eventually completely replaced with automated security systems.



CROSS-PROFESSIONAL SKILLS



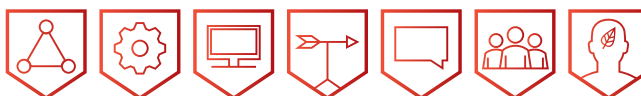


# EXPERT FOR MITIGATING SYSTEMIC ENVIRONMENTAL DISASTERS

Engineer who deals with time-delayed disasters, which people become aware of gradually, e.g. pollution around large industrial centres, the Pacific plastic dump, the thawing permafrost, radioactive dumps, etc. The engineer is tasked with designing and implementing plans to mitigate such disasters and prevent them from happening again. Aside from the usual environmental problems, such as global warming and deforestation, new threats are emerging, which humankind became concerned with only recently. For example, a large garbage patch was discovered in the Pacific Ocean in 1997. Because of oceanic currents, an area, which, according to various estimates, takes up between 0.7 and 15 million square kilometres, is littered with over 100 million tons of garbage. Most of the garbage consists of fine pieces of plastic that may be toxic and are eaten by fish or jellyfish. To handle such types of threats, we need highly qualified specialists able to make decisions under uncertainty.



## CROSS-PROFESSIONAL SKILLS





# PERSONAL SECURITY DESIGNER

Specialist tasked with assessing and designing the life of a person in terms of all possible risks (from genetic disposition to specific diseases to the chance of becoming a crime victim) and their prevention. The specialist may be hired as a staff consultant or to provide one-time services, e.g. if a client is going on a business trip to a dangerous region.



## PERSONAL SECURITY DESIGNER'S REPORT

Client, 30 years old, going to N. city. Trip to last from 10 December to 20 December.

### PURPOSE OF THE TRIP

Business

### TRANSPORT

airplane, car

### КЛИМАТ

CLIMATE

### POTENTIAL THREATS

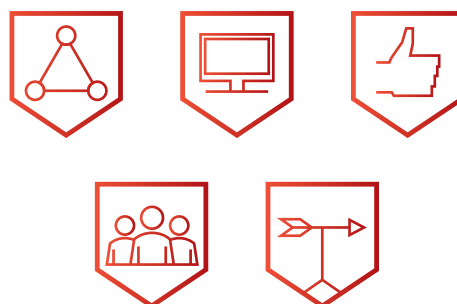
*Health:* hepatitis A and B, typhoid, diphtheria, tetanus and brain fever. Vaccination needed. No malaria threat, as the client has been diagnosed with Mediterranean anaemia, rendering him immune. Air pollution may cause asthma attacks. Some meals on the hotel restaurant's menu contain peanuts and may cause a strong allergic reaction (see Appendix 3 for the list).

*Crime:* probability of valuables theft: 0.01%; food, drink and cigarette poisoning by robbers: 0.005%; robbery: 0.007%. Probability of becoming a victim of a more serious crime is insignificant. See Appendix 1 for a list of districts to avoid.

*Road accidents:* we identified 3 points of hazard on the planned route through the city. See Appendix 2 for an alternative route.



## CROSS-PROFESSIONAL SKILLS





# ERGONOMIC DESIGNER OF WEARABLE SECURITY DEVICES

Specialist engaged in developing gadgets for the additional security of the user in an emergency. The job requires a smooth combination of common sense and imagination, as self-protection issues may be approached from different directions. For example, Armstar has designed the protective sleeve BodyGuard, equipped with a camera, alarm device, and an electric shocker. It will help the wearer protect himself, while designed to not inflict lethal wounds on a perpetrator. South Korea has invented an even milder option, i.e. a jacket equipped with mini cameras. In case of an assault, it takes photos of the attacker and publishes photos in the Internet, so that the criminal will not be able to conceal his identity.



## CROSS-PROFESSIONAL SKILLS



# BUSINESS CONTINUITY MANAGER

This specialist ensures the continuity of business processes in case of any problems or IT system failures at a facility caused by cyber attacks, software errors, man-made disasters affecting Internet connection, or other emergencies.



## CROSS-PROFESSIONAL SKILLS





## WHERE CAN I RECEIVE BASIC TRAINING IN THE SPECIALTY?

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- Institute for Occupational Safety
- National University of Science and Technology (MISiS) (Technosphere Safety)
- Moscow Institute of Technology
- (BMSTU)
- Lomonosov Moscow State University (Faculty of Computational Mathematics and Cybernetics)
- National Research University of Electronic Technology (MIET)
- Social and Law Institute of Economic Security (SPIEB)
- Civil Defense Academy (CDA) EMERCOM of Russia

Part II

# ENDANGERED JOBS

“You can never plan the future by the past.”

Edmund Burke



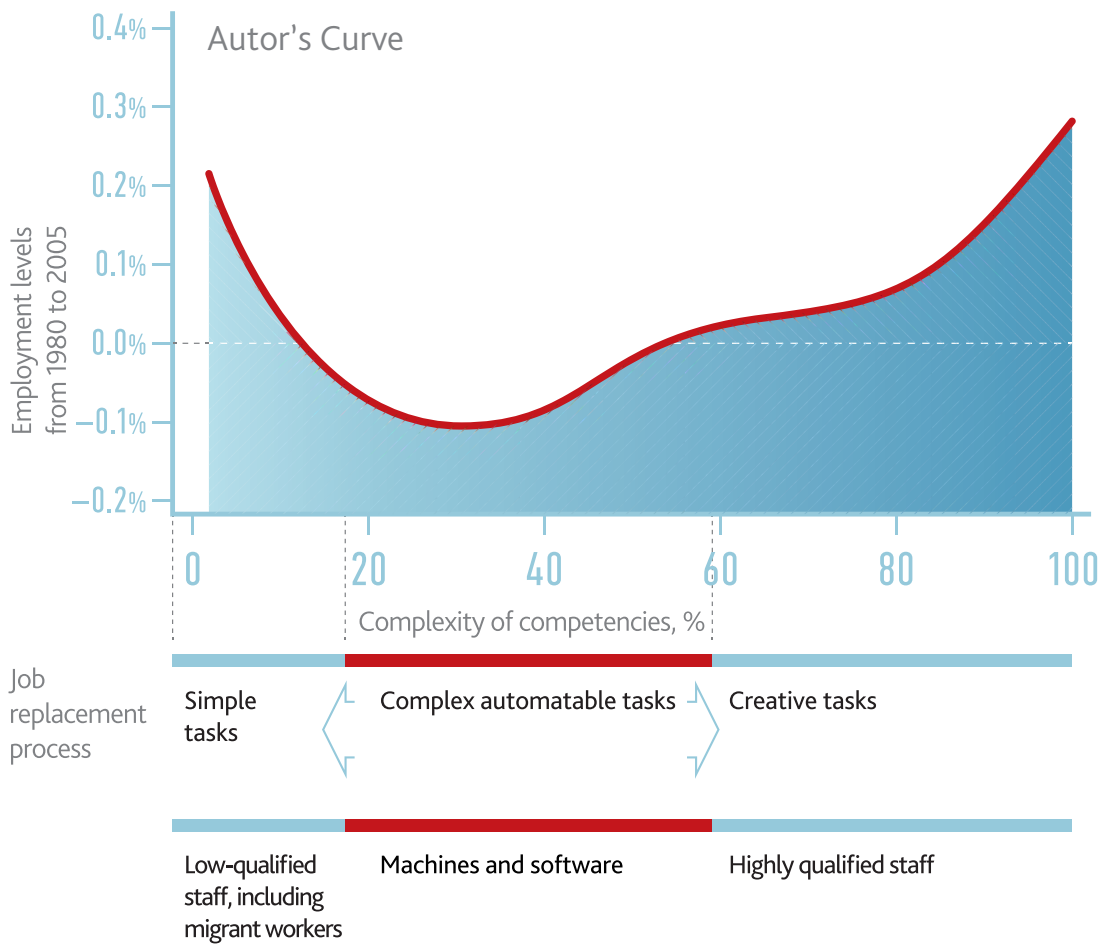
	<b>ПОСЛЕДНЯЯ ТРАНСПОРТНАЯ КОМПАНИЯ</b>
<small>Иванов</small>	<b>Иванов Сергей</b>
<small>1234567890</small>	<small>1234567890</small>

# ENDANGERED JOBS

The life of individuals and the society is changing rapidly, entailing the emergence of new jobs, as well as the obsolescence of old ones. Why is it happening? This process is anything but new and has been taking place for over three hundred years, ever since the beginning of the Industrial Revolution. Specialties appear and disappear faster with the acceleration of technological progress. According to various estimates, during the coming twenty years, between one-third and half of jobs in developed industrial countries will be replaced by robots, software and other automatic solutions.

Which laws determine the obsolescence of a job?

## MEDIUM SKILLS THREATENED BY AUTOMATION



**Autor's Curve** was devised by the U.S. economist David Autor. It illustrates the change in employment in U.S. industrial sectors between 1980 and 2005, depending on workers' qualifications. The graph shows employment growth for low and highly-qualified workers and a decrease for medium-qualified workers. This happened primarily due to a wide spread of

automated solutions for tasks of medium complexity. Automation in industries always begins with medium qualification jobs. These operations contain enough standard components to be easily automated and are sufficiently paid for to make automation economically attractive for business owners.

# WHAT IS TAKING YOUR JOB?

## PARTLY



### ROBOTS

Robots (and mechanical devices before them) first took over physically demanding jobs, and are now taking easier ones. Many modern mechanical engineering and electronic plants have 90% of their production operations automated. Man is left with the most complicated tasks, i.e. assembling end products and looking after the machines



### SOFTWARE

White-collar workers even in quite sophisticated areas are finding themselves up against serious competition from artificial intelligence. In 2013, IBM Watson software began diagnosing cancer, and it can achieve 90% accuracy based on test results, while even an experienced diagnostician can offer 50% at most. AI will eventually be able to replace humans in many aspects of routine intellectual labour.



### MIGRANT WORKER

Migrant workers coming from other countries or poor regions of the same country is a phenomenon characteristic of any economically developed state. As a rule, these workers are low-qualified but less demanding, and are prepared to work for much lower wages, which is why they often perform a significant portion of low-skilled work (such as street cleaning, repairs, or household work).

## FULLY



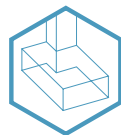
### OUTSOURCING

Since the mid-1990s, developed economies had been swept with an "outsourcing epidemic", with production facilities or parts of services moved out to developing countries. Thus, China became the "world's factory", while software development and call centers were moved to India. Today, outsourcing is becoming far less popular, with many countries taking back their industrial facilities. Still, outsourcing has made entire industries disappear. Thus, the production of footwear and other light industrial goods was almost completely moved from Russia to China, leaving only design and sales in the home country.



### BACTERIA

Surprisingly, bacteria may become a competitor to many industries in the future. Genetically modified bacteria are chemical factories that can produce food and pharmaceuticals, purify water and air, or manufacture construction materials. There is even a chance of bacteria replacing the oil and gas industry. The so-called fourth-generation biofuels (facilities to produce it are already under construction in Brazil) are the product of a bioreactor, where specially bred bacteria turn organic waste into diesel fuel.



### 3D PRINTER

Printing things at home, using internet-downloaded templates, may take the place of industrial production. 3D printing is now rather expensive and slow, while the basic material used for it is plastic. However, producers promise that in the future 3D printers will be able to mass-produce household appliances, electronic devices, clothes, furniture, automobile parts, pharmaceuticals, and even food. Prototypes printing all those things already exist. With printers at every home, there will be no more need for big factories and plants in many industries, although this will not happen until 20-25 years from now.

# CAN THE MACHINE REPLACE THE WORKER?

Automation and competition on the labour market do not affect mostly complex jobs with a creative component.

## WHY IT CANNOT?

## WHY IT CAN?

### Highly qualified

**Creative workers:**  
machines are unable to reproduce artistic creativity, professional expertise, and skill in details

**Software (artificial intelligence):**  
routine intellectual operations of any complexity can be easily put together into an algorithm and controlled by software that can process arrays of data many times greater than those available to humans

### Low qualified competencies

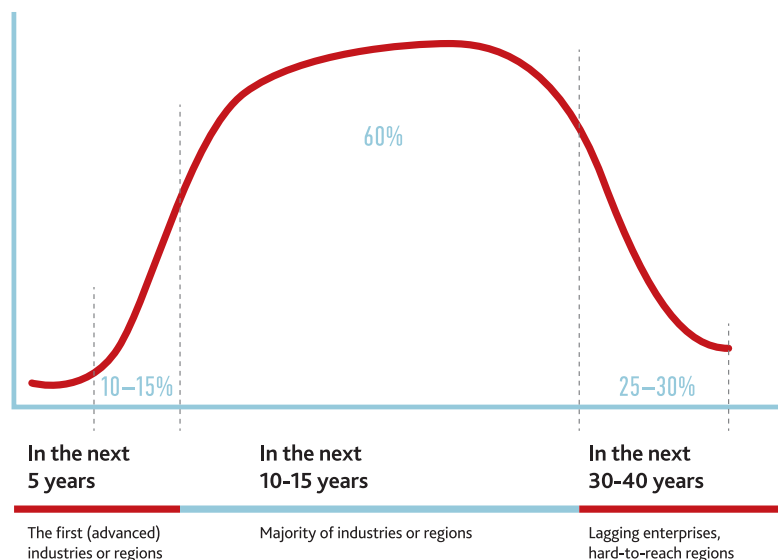
**Migrant worker:**  
migrant labour is cheaper than the production, operation and maintenance of robots for low-qualified work

**Robot:**  
heavy physical labour, work in harsh conditions, and routine manual labour can be, predictably and more effectively, performed by automatic devices

# JOB OBSOLESCENCE PROCESS

The “death” of a job is a protracted process.

Jobs become obsolete gradually. In the beginning, we see the first portents (experiments to replace specialties with new technological solutions), then the process becomes all-encompassing, and the final stage may take entire decades (e.g. in certain regions of a country people may drive horse carts, although others use automobile transport).



# WHITE-COLLAR JOBS TO BECOME OBSOLETE BETWEEN 2013 AND 2030

## BEFORE 2020

- \* ACCOUNTANT
- \* QUANTITY SURVEYOR
- \* CREDIT MANAGER
- \* STATISTICIAN
- \* SHORTHAND TYPIST/  
TRANSCRIPTIONIST
- \* COPYWRITER
- \* PROOFREADER
- \* PHOTO EDITOR  
SCENIC CARPENTER
- \* LIBRARIAN
- \* RECORD KEEPER/  
ARCHIVIST
- \* LECTURER
- \* TRAVEL AGENT
- \* TEST ENGINEER
- \* STUNT PERFORMER

## AFTER 2020

- \* LEGAL ADVISER
- \* NOTARY
- \* BANKING CLERK
- \* REAL ESTATE AGENT
- \* TOUR GUIDE
- \* ANALYST
- \* JOURNALIST
- \* SPORTS ANALYST
- \* SECRETARY/PERSONAL  
ASSISTANT  
TRANSLATOR/INTERPRETER
- \* GOVERNMENT SERVICE  
OPERATOR
- \* LOGISTICS EXPERT
- \* DIAGNOSTICIAN
- \* SYSTEM  
ADMINISTRATOR
- \* CONTROL ROOM  
OPERATOR
- \* NAVIGATOR
- \* PHARMACIST

# WHY DO JOBS BECOME OBSOLETE?

## BEFORE 2020

### × ACCOUNTANT

Special software already allows a novice to learn basic operations in audit and accounting fairly quickly. In the future, software will be able to replace people completely.

### × QUANTITY SURVEYOR

Tasks performed by specialists in this occupation are being entirely taken over by intelligent software. The volumes and complexity of data are growing, and man is finding it difficult to process them quickly and to a good quality standard. In the next five to seven years, the number of specialists required will decrease rapidly, while their functions will be limited to maintaining intelligent software and systems performing cost estimates.

### × CREDIT MANAGER

It is already possible for people to apply for loans online. In the future, special computer software will make lending decisions upon retrieving information about the potential borrower from Big Data systems.

### × STATISTICIAN

In the future, the collection, processing and structuring of data will dramatically increase in complexity due to growing data volumes. The existing knowledge and skills will not be sufficient for it, and statisticians will be replaced by Big Data specialists.

### × SHORTHAND TYPIST/ TRANSCRIPTIONIST

Even now speech-to-text systems (e.g. Yandex.Diktovka) allow replacing this type of employee. Technology is advancing so fast that by 2017 this type software will be used everywhere.

### × COPYWRITER

Computer software (bots) connected to huge databases containing texts, articles, manifestos, literary works, etc. are already capable of generating medium-quality texts of required literary forms on any subject, by using standard syntactic structures.



**PROOFREADER**

Automatic systems for text revision will appear, taking into account all grammar and spelling rules of a language. Spelling and punctuation can already be checked in an MS Word document or a browser. These programmes are not impeccable now, but with the progress of semantic text analysis technologies they will be able to replace humans in the near future.

---

**PHOTO EDITOR**

Very soon, people will not be no longer needed to search for illustrations for a publication. A convenient algorithm for photo and image search in the Internet will allow authors to deal with texts, images and videos.

---

**SCENIC  
CARPENTER**

Modern computer graphics can produce any backdrop, from a pristine jungle to a Gothic castle. Why having to deal with pavilions when you can draw an entire 3D city? Therefore, scenic carpenters will only be left in theaters, being replaced by computer graphic designers in the cinema.

---

**LIBRARIAN,  
RECORD KEEPER/  
ARCHIVIST**

Digitizing all libraries and archives, with 24/7 access to any information from any part of the world, is producing a revolution in the archive and library segment. Librarians and archivists as we know them will disappear, whereas archive management as an activity will move to network-based media.

---

**LECTURER**

The tasks of “loudspeaker” teachers will be altered by the progress of educational technologies and changing requirements of students, as writing down dictated standard lectures reduces motivation for studying, any information can be found in the Internet, while the world's leading schools offer various free and paid online certification courses to all those willing. Lecturers should give students unique experience that they cannot obtain anywhere else. Eventually, lectures will be read only by those who possess unique knowledge or are able to relate to the audience and can present information in an artistic manner.

**TRAVEL AGENT**

There are several factors killing the job. More and more often, people prefer to travel by themselves rather than in a group, and a spontaneous holiday is preferred to an accurately planned one; Abundant internet services and applications for finding transfer, accommodation and leisure planning (at no commission fee, with 24/7 access) allow users to organize their leisure without intermediaries. The job will disappear as increasingly more people learn to organize their own tours with the help of the Internet. In the future, travel agents will only remain in the premium segment, where a real person – rather than a programme – working with the client will be especially valued.

---

**STUNT  
PERFORMER**

There is no more need to perform real head-spinning stunts. Thanks to computer video processing, an actor without special physical training can jump out of a speeding train or weather a turbulent waterfall. Today's stunt actors are becoming a sort of circus performers in special shows.

---

**TEST ENGINEER**

Robotic complexes, simulators and computer modelling can substitute humans in many tests of various complexity and hazard level. The job of a test engineer will become an exotic phenomenon over time.

## AFTER 2020

### × LEGAL ADVISER

Answers to common questions can be found in Q&A sections of most legal portals, necessary documents are easy to find in databases, and legal advice can be obtained in a community or from an expert. Online advice will be needed in much fewer cases, significantly decreasing demand for this type of specialists.

---

### × NOTARY

Development of remote access services for obtaining documents and banking transactions using a digital signature, possibility to connect to databases to check identity, solvency or obtain a police certificate are making the functions of a notary obsolete. The job may only remain due to requirements of obsolete legal norms.

---

### × BANKING CLERK

Nearly all banking transactions are moving to the Internet and are becoming as close as possible to the user, while cash can be collected in significant amounts from an ATM. Within the next 10 to 15 years, the remaining banking clerks will only serve clients who fail to adapt to new technologies.

---

### × REAL ESTATE AGENT

Internet services allow finding properties with any parameters anywhere in the world, without leaving home; payment transactions are also made via the Internet, eliminating commission fees. As in the case with travel agents, real estate agents will remain mainly in the premium segment, where personal contact with the client is important.

---

### × TOUR GUIDE

Individual programmes will replace standard tours, and human guides will be replaced by their virtual counterparts and special tourist software and applications that help find one's bearings in a location and obtain necessary information on the subjects of the user's interest.

**ANALYST**

Intelligent systems are already able to perform analytical tasks in various fields, This is especially true for standard and repetitive operations. Eventually, analytical services will be replaced with services based on artificial intelligence.

---

**JOURNALIST**

Speech-to-text and text writing software enables automating and accelerating this previously creative job. For example, Bloomberg has replaced part of its news writing staff with an AI application that writes trading news faster and more creatively than human reporters. Amateur reports and blogs, quickly rising in popularity thanks to their liveliness, honesty and naturalism, are competing with TV, radio and press journalists of the leading mass media. In 20 years, artificial intelligence will take over 95% of tasks connected with mass media. Journalists' main job will be literary journalism, built upon the author's original views and approach, close to fiction or films.

---

**SPORTS ANALYST**

The ability to memorize and compare the details of sports biographies and match results of ten years ago, to analyze information and forecast possible outcomes of future games was irreplaceable in a pre-computer era, but in the near future computers will manage this task perfectly.

---

**SECRETARY/  
PERSONAL ASSISTANT**

Computer software will be able perform most functions of a secretary, i.e. dispatch calls, make up schedules, plan meetings, book air tickets for business trips, etc. Already there are programmes able to take up part of them. The challenge is to develop an optimal solution combining as many functions as possible.

---

**GOVERNMENT  
SERVICE OPERATOR**

The emergence of services such as Government Services Portal or Electronic Government, as well as civil crowd sourcing, is transforming the job of a municipal worker, at least reducing the number of document handling employees.

**TRANSLATOR/  
INTERPRETER**

Semantic translation software is developing faster than ever, with simple technical translation performed automatically even today. These solutions are already able to translate both written and oral speech. Since the technology continues to develop, the niche of human translation will remain only for highly qualified specialists who perform highly complicated or literary translation.

---

**LOGISTICS  
EXPERT, CONTROL  
ROOM OPERATOR**

Transport infrastructure is becoming more complex, cargo delivery is becoming module-based, freight and passenger flows are growing, and user requirements to the quality and speed of delivery are increasing. These tasks are becoming more and more difficult for a human to perform. However, automated freight control and tracking systems are being implemented, with all kinds of sensors and satellite monitoring capabilities, and intelligent software for delivery routing and tracking. Humans are only needed for control at the highest level, i.e. decision making in case of emergencies. This is why in the job of a control room operator and logistics expert the number of employees will gradually reduce and the complexity of their work will increase.

---

**DIAGNOSTICIAN**

Mobile diagnostic devices and automated expert systems are gradually replacing the functions of this specialist. Even now, the AI-based system IBM Watson can diagnose dangerous diseases, such as cancer, with an accuracy several times higher than that offered by an experienced diagnostic doctor. Within the next five years, the microdiagnostic devices market will grow rapidly: in any conditions and at any time, people will be able to have their physiological parameters scanned and immediately transmitted to a particular doctor via the Internet. Primary diagnostics at clinics and hospitals will also be performed by special equipment with intelligent software. In 15 to 20 years, the need for new diagnosticians will be quite low. Specialists that will appear in the next five to ten years will be enough to satisfy the need for these professionals when the specialty becomes obsolete across Russia before 2030.

**SYSTEM ADMINISTRATOR**

AI systems will allow eliminating system failures quickly and almost imperceptibly for the user. Traditional system administrators are being replaced by software and specialists for its adjustment.

---

**NAVIGATOR**

The basic functions of this professional, which are to lay the route, calculate and mark the progress on a map, can already be performed by GPS navigators.

---

**PHARMACIST**

Many pharmacies are beginning to use internet resources, as a significant portion of buyers can select their own medications in the Internet, either on their own or at the recommendation of a doctor. Logistic services can deliver an order at any time of day. Pharmacists will remain either to provide medications in case of emergency, or to provide services to people who cannot care for themselves. There will be very little need for pharmacists after 2020.

# BLUE-COLLAR JOBS TO BECOME OBSOLETE BETWEEN 2013 AND 2030

## BEFORE 2020

- 
- \* TICKET INSPECTOR
  - \* WATCHMAN
  - \* ELEVATOR REPAIRMAN
  - \* PARKING VALET
  - \* CALL CENTRE OPERATOR
  - \* POSTMAN
  - \* HIGHLY QUALIFIED AGRICULTURAL WORKER
  - \* COURIER
  - \* MUSEUM ATTENDANT
- 

## AFTER 2020

- \* FREIGHT TRAIN DRIVER
  - \* TRAFFIC OFFICER
  - \* SECURITY GUARD
  - \* MINING ENGINEER
  - \* MINER
  - \* PACKER
  - \* WELDER
  - \* DRILLER
  - \* FOREMAN
  - \* TRANSPORT TERMINAL WORKER
  - \* SEWING MACHINIST
  - \* PORTER
  - \* CONCRETE WORKER
  - \* DRY CLEANER'S WORKER
  - \* WAITER
  - \* COACH
-

# WHY DO JOBS BECOME OBSOLETE?

## BEFORE 2020



### TICKET INSPECTOR

Ticket inspectors are already a form of honorary retirement. By the late 2010s, most people will have electronic cards to pay at automated scanners when entering buildings and transport, when visiting events, etc.

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### WATCHMAN

Automatic keys, retina and fingerprint scanners used for security purposes in offices and residential premises are gradually replacing these workers. In developed countries, watchmen have already become a rarity, and in the next five to seven years the job will disappear from large Russian cities.

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### ELEVATOR REPAIRMAN

Increasingly more automated engineering solutions for repairing and servicing elevators and intelligent control systems are gradually replacing this job.

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### PARKING VALET

Increasingly more producers add intelligent parking systems to their basic versions of cars, thereby automating the tasks performed in the job. After 2020, AI will control 80% of new cars. Parking management is also being automated, with the function being performed by surveillance cameras, automatic barriers and parking meters.

---



### CALL CENTRE OPERATOR

Simple communicator software is already able to answer mass user questions. Further development of technology will replace humans with intelligent software that will generate answers to any question on a particular subject, based on a database.



**POSTMAN**

Correspondence is moving to the digital space, and deliveries are made by forwarding companies. Automated postal offices are gaining popularity in developed countries. The job of postman will gradually become history, remaining more as a curiosity for tourists (much like horse cart drivers).

---

**HIGHLY  
QUALIFIED  
AGRICULTURAL  
WORKER**

Abundance of automated robotic complexes and control systems used in various agricultural activities is leading to humans being pushed out of the agricultural sphere. This process has been taking place for decades and shows no signs of stopping.

---

**COURIER**

Courier drones are gradually entering the market. In the Aviation section, we have shown examples of successful application of unmanned flight technologies in delivery services. Drones make deliveries faster and environmentally safer, since most of them are powered by electricity and do not pollute the environment.

---

**MUSEUM  
ATTENDANT**

Automatic security systems will look after public order, while special applications will help visitors find their way in the galleries. Museum attendants may remain only to create a specific atmosphere.

## AFTER 2020

### × FREIGHT TRAIN DRIVER

Every year, unmanned control systems become ever more sophisticated. First of all, they will be installed in metro and freight trains, with human intervention only in case of emergency. After 2020, an autopilot on a freight train will become an industry standard.

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### × TRAFFIC OFFICER

The development of intelligent traffic control systems (traffic lights, guard rails, surveillance cameras, wireless connection to any vehicle, etc.) will eventually lead to the full automation and robotization of this specialty.

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### × SECURITY GUARD

Security standards will change and smart automated control systems will replace traditional solutions in security. Information on several facilities will be sent to a single control room, while immediate response teams will resolve situations that cannot be managed by computer systems. This is why small private security firms will no longer be needed. Besides, the functions of a security guard can be performed by a drone equipped with a video camera and motion and heat sensors.

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### × MINER, MINING ENGINEER

These blue-collar jobs are disappearing due to the increasing complexity of geological survey and mining processes (and therefore their gradual robotization) and the declining demand for mined raw materials.

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### × PACKER, WELDER

In the next 10 to 15 years, this professional of the food and chemical industry will begin to be replaced by robotic systems that improve the intensity, safety and quality of production. In 20 to 25 years, capabilities of bio-3D printing will move production processes to users' homes, where the latter will be able to print any food or chemical products, buying only the formula and suitable powders for printing.

**DRILLER**

Conditions of producing minerals and energy are growing in complexity, as easy-to-reach resources are coming to an end. In the future, drilling will be performed in areas difficult or impossible for people to work in (Extreme North, offshore areas, etc.). The advance of robotics and satellite control systems allows removing man from the production cycle, while increasing the volumes and intensity. The romantic job of a driller will be replaced by a drilling robot operator, often able to work remotely.

---

**FOREMAN**

The job will be gradually replaced with a foreman watcher (see Part I, Construction).

---

**TRANSPORT  
TERMINAL WORKER**

Already there are information robots that help passengers find their way in terminals, and special machines, such as cleaners or towing vehicles, are becoming more and more automated. In the future, they can be controlled remotely, allowing airports and railway stations to be managed with a lot fewer staff.

---

**SEWING  
MACHINIST**

The advance of cheap 3D printing will enable producing clothes and footwear quite quickly, at home and to preset parameters. A sewing machinist will be hired rather as a quite expensive specialist for custom one-time jobs. See more in the Light Industry section.

---

**PORTER**

At the Japanese airport Kitakyushu, there are already robot porters that can carry luggage of up to 50 kg and react to voice commands. U.S.-based Five Elements Robotics has invented the personal robot helper Budgee which can carry various weights after its owner, e.g. things purchased in a household appliance store. These technologies are developing and getting cheaper fast, and humans cannot compete with the robots in speed and stamina.

**CONCRETE  
WORKER**

Proliferation of 3D printing and other innovative construction techniques will reduce the need for working hands at a construction site. Traditional blue-collar jobs will be driven out by operators of construction 3D printers and other equipment.

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**DRY CLEANER'S  
WORKER**

Robotic dry cleaning shops are already used to clean automobile interiors, while the company White Conveyors, specializing in highly sophisticated means for sorting and storing clothes, offers an automated dry cleaning system where clients can bring and take back their things through a special terminal, with a smart conveyor minimizing human interference. Thus, there will be no more need for human workers.

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**WAITER**

Robotic waiters are widely used in Japanese restaurants. However, since communication is an important part of the service in this job, robots will replace humans in chains where the most important are speed and accuracy of the order, but not in high-class restaurants.

---

**COACH**

“Technical” coaches helping sportsmen train certain moves (e.g. kicking the ball) will not be needed in the future, as the coach will only have to look after an athlete's physical shape and the choice of the right game strategy. And sports robots and trainers will help sportsmen train jumping and serving techniques.

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Russian Grids

R-Pharm

Children's Products and Services Association

Cisco

IBM

Intel

# FORESIGHT SESSION PARTICIPANTS

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## BIOTECHNOLOGY

- Bayer
- R-Pharm
- L.K. Ernst All-Russian Research Institute of Animal Husbandry
- Centre for Experimental Embryology and Reproduction Biotechnology
- Institute of Applied Biochemistry and Mechanical Engineering (Biochemmash)
- Lomonosov Moscow State University
- I.M. Sechenov First Moscow State Medical University
- Russian Academy of Agricultural Sciences
- National Association of Genetic Security
- Russian Society of Biotechnologists
- Foundation for Promotion of Small Businesses in Technology-Intensive Industries
- VneshTekhnika
- Vlastor
- Centre for Experimental Embryology and Reproduction Biotechnology
- Medical Research Centre Immunculus
- Scientific Centre of Information Medicine
- I.M. Sechenov First Moscow State Medical University
- Moscow Institute for Doctor Development

## ENERGY GENERATION AND STORAGE

- Rosatom Group
- Nuclear Safety Institute (IBRAE)
- Scientific Equipment Manufacturing Company ANN
- A.M. Prokhorov Academy of Engineering Sciences
- Kurchatov NBIC Centre, National Research Centre Kurchatov Institute (Technology Platform Bioenergetika)
- Energomash
- LLC Energy Saving Technologies
- Russian Union of Employers in Nuclear Industry, Power Engineering and Science

## HEALTHCARE

- R-Pharm
- Chem Div. Inc
- Technology Platform Medicine of the Future
- Research and Production Firm Rokhat
- Professional Practice Community Preventive Medicine
- National Centre for Research and Development in Healthcare and Social Sector Support of Health

## POWER GRIDS AND POWER MANAGEMENT

- Russian Grids
- Science and Technology Centre of Federal Grid Company of Unified Energy System
- OJSC Mosenergo
- Interregional Distribution Grid Company
- OJSC Oboronenergo
- Agency on Forecasting Balances in Electric Power Industry
- LLC Power Engineering and Industry Technologies
- Russian Union of Employers in Nuclear Industry, Power Engineering and Science

## INFORMATION AND TELECOMMUNICATION TECHNOLOGIES

- Cisco
- IBM
- IBS
- Intel
- Rostelecom
- MegaFon
- Svyaznoy
- Huawei
- Sirius Concern
- PingWin Software
- LinuxCenter (Mezon.Ru)
- Imperative Media
- SoftLogic Rus
- Orticon Group
- Engineering Group
- Applied Technologies
- Novosibisk Institute of Software Systems

## MINING AND MINERAL PRODUCTION

- Gazprom
- Rosneft
- EvrazHolding
- EvrazRuda
- Nornickel
- Techsnabexport
- Vernadsky Institute of Geochemistry and Analytical Chemistry
- EKA Group

- Sergo Ordzhonikidze Russian State Geological Prospecting University
- KOKS Mining
- Siberian Coal Energy Company (SUEK)
- RUSAL
- Tatneft

## ROAD TRANSPORT

- Ministry of Transport of the Russian Federation
- Russian Railways
- Federal Passenger Company
- Freight One
- State Transport Leasing Company
- Scientific Center of Complex Transport Problems
- Russian Union of Transport Workers
- Moscow Metro
- Moscow State University of Railway Engineering (MIIT)
- Moscow Automobile and Road Construction University (MADI)
- Petersburg State Transport University

## AIR TRANSPORT

- United Aircraft Corporation
- Vnukovo Airport
- Sheremetyevo Airport
- Transaero Airlines
- Aeroflot
- S7 Airlines
- Administration of Civil Airports (Airfields)
- Moscow State Technical University of Civil Aviation
- Ulyanovsk Higher Civil Aviation School
- Soloviev Rybinsk State Aviation Technical University

## WATER TRANSPORT

- United Shipbuilding Corporation
- Federal Agency for Sea and Inland Water Transport
- Trade Union of Water Transport Workers
- Association of Sea Commercial Ports
- Summa Group
- Rosmorport

- Atomflot
- Moscow Channel
- Russian Sailors' Trade Union
- Moscow State Academy of Water Transport
- Admiral Makarov State University of Maritime and Inland Shipping

## SPACE

- Russian Federal Space Agency
- S.P. Korolev Rocket and Space Corporation Energia
- Oboronenergo
- Central Research Institute of the Ministry of Defense of the Russian Federation
- Space Research Institute
- Center for Operation of Space Ground-Based Infrastructure
- Science and Education Centre Space Ecology

## ADVANCED MATERIALS AND NANOTECHNOLOGY

- RUSNANO
- Bayer
- VneshTekhnika (biotechnology, nanotechnology)
- Teploobmennik
- Nanomet
- Nilgrafit
- Institute for Physical Research and Technology (State University of Nizhny Novgorod)
- Moscow State University of Fine Chemical Technologies
- Tver State Technical University

## ROBOTICS AND MECHANICAL ENGINEERING

- Russian Engineering Union
- ITMO University (Saint Petersburg)
- A.M. Prokhorov Academy of Engineering Sciences
- Center for Operation of Space Ground-Based Infrastructure
- Kurchatov NBIC Centre, National Research Centre Kurchatov
- Institute
- Summa Tekhnologiy
- Uralmashplant
- Uralvagonzavod
- United Engine Corporation
- Volnoe Delo Foundation
- DMG MORI

## CONSTRUCTION

- Bayer
- Invent-K
- Association of Multifunctional Centres for Government and Municipal Services
- Foundation for Promotion of Small Businesses in Technology-Intensive Industries
- Special Economic Zones
- ABOK North-West
- Russian Green Building Council
- Moscow Automobile and Road Construction University (MADI)
- Genplan Institute of Moscow
- Ulyanovsk Technology Transfer Center
- College of Architecture, Design and Reengineering

## FINANCIAL SECTOR

- Ernst&Young
- Cogitatum
- Special Economic Zones
- AERGroup
- Russian State University of Tourism and Service
- All-Russian Academy of Foreign Trade



- Plekhanov Russian University of Economics
- State University of Management
- National Research University – Higher School of Economics

## MANAGENET (CORPORATE GOVERNANCE)

- Ernst&Young
- Open Government
- Russian Management Society
- Orticon Group
- National Center for Manager Certification
- Special Economic Zones
- Agency of Industrial Information
- State University of Management
- Moscow State University of Economics, Statistics and Informatics

## GOVERNMENT SERVICE AND NON-PROFIT ORGANIZATIONS IN THE SOCIAL SECTOR

- Association of Multifunctional Centres for Government and Municipal Services
- Russian State University of Tourism and Service
- Fund for Electronic Democracy
- National Confederation Human Capital Development
- Centre for Social Research of Kaluga Region

## EDUCATION

- Junior Academy of Sciences Intellect of the Future
- Moscow Management School SKOLKOVO
- National Research University – Higher School of Economics
- Soling
- Progressor Group
- Novosibirsk State University

- Training Centre for Professional Education (Moscow Government Education Department)
- National Confederation Human Capital Development

## CHILDREN'S PRODUCTS AND SERVICES

- Children's Products and Services Association
- Children's Cartoon Association
- Detsky Mir
- Lego Russia
- Mattel
- Masha and the Bear
- Vesna Toy Factory

## METALLURGY

- Uralelectromed
- Norilsk Nickel
- Nizhny Tagil Iron and Steel Works
- Chelpipe (Chelyabinsk Pipe Plant)
- TMK Group
- Seversk Pipe Plant
- Festo Didaktika

## HOSPITALITY

- Russian Federal Agency for Tourism
- Russian International Academy of Tourism
- Baltic Academy of Tourism and Entrepreneurship
- P.G. Demidov Yaroslavl State University
- Association of Guides and Tour Managers
- Hotel and Restaurant Federation
- RESTCON
- SPEKTR Business Institute
- LinkWest Group

## MEDIA AND ENTERTAINMENT

- Distance Learning Portal Prodlenka
- Smeshariki Project
- Digital October

- 8 Lines Agency
- Museum of Contemporary Art Garage
- Open Stage directorate
- National Association of Event Organisers
- Hairy Cheese Agency
- LinkWest Group

## AGRICULTURE

- Russian Grain Union
- AGROshturman Center
- Rusagro-Invest
- GOSNITI
- LLC Eco-Control
- Samara State Agricultural Academy
- Bioengineering Centre (Russian Academy of Sciences)
- Vladimir Research Institute of Agriculture
- Organic Agriculture Union
- Federal Centre for Agricultural Consulting and Professional Development in Agroindustrial Complex
- Penza Research Institute of Agriculture
- Ruzskoe Moloko

## LIGHT INDUSTRY

- Fashion Consulting Group
- Management and Communication in Fashion Industry (National Research University - Higher School of Economics)
- Centre of Creative Industries (Lomonosov Moscow State University)

- Wild Orchid Group
- Moscow Sewing Association Smena
- Tchaikovsky Textile
- EVA Company
- Moscow State University of Design and Technology

## SECURITY

- Positive Technologies
- Russian Detectives Association
- Security Company of Russian Ministry of Internal Affairs
- DST PUA Accord-TSHM
- Seven Departments Group
- Non-Profit Partnership National Board of Polygraphologists
- Envision Group
- Diasoft
- State Fire Academy of EMERCOM of Russia
- Dell Software

## ART AND CULTURE

- Open Stage directorate
- State Centre of Contemporary Art
- Museum of Contemporary Art Garage
- Russian Federal Agency for Tourism
- Université Paris 1 Panthéon-Sorbonne
- Polytechnic Museum

# AGENCY FOR STRATEGIC INITIATIVES:

Supporting leadership initiatives aimed at finding and developing professionals of the future.

[www.asi.ru](http://www.asi.ru)

Since 2011, the Agency has been initiating and supporting strategic projects to develop human capital as the basis for economically and socially successful changes in the new Russia. Designing and developing competencies in specialists in white-collar and blue-collar jobs involves federal authorities, administrations of successful regions, flagship companies of fast-growing branches of the economy, the best schools, development institutions, professional and community organizations.

One of the priority fields in the effort to multiply human capital is supporting projects aimed at finding and developing the creative potential of high-school and university students, and young scientists.

Many of the professions included in the Atlas are not yet taught in vocational schools and universities. Nevertheless, there are projects that help develop relevant competencies and build a career path to match the future trends.

## BIOSCIENCE PLATFORM

Participate: <http://www.bioforum21.ru>

This educational platform was established on the basis of the Pushchino Scientific Center and includes a complex of distant and classroom-based education programmes for preparing highly qualified professionals in biology, pharmacology, and biomedicine. The platform of the project is hosting a series of training activities involving foreign and Russian scientists. The activities include webinars, master classes, lectures, training sessions, experiments in laboratories, conferences, and foreign internships.

## FUTURE BIOTECH

Participate: <http://futurebiotech.ru/>

Future Biotech is a non-governmental educational organization with an objective to promote advanced biotechnology in Russia, as well as to shape the future agenda of biotechnology across the world. Future Biotech was founded by successful practicing scientists and entrepreneurs who are confident about the successful future of the Russian biotechnology sector. Every year, Future Biotech holds two school sessions for students and young scientists.

Winter school: traditional format, jointly with Prof. Mikhail Gelfand's Modern Biology, with a primary focus on the scientific part, daily lectures and nightly business activities and round tables.

Summer school: a new international format focused on classes with approximately equal numbers of participants from Russia and the EU; the main topic is translational medicine and commercialization of research projects.

In 2014, Future Biotech launched at Lomonosov MSU a master's programme at the intersection of economics and biotechnology.

## GRIDOLOGY.EDU

Participate: <http://gridology.ru/>

The project is aimed at creating centres for the development of young scientists and professionals in innovative fields of intelligent power engineering and creating the Smart Grid 2.0. The Innovative Competence Centre (ICC) is a centre for collecting, creating and promoting new scientific and engineering practices in certain areas of intelligent power engineering.

## CANSAT RUSSIA

Participate: <http://roscansat.com>.

Thousands of high-school and university student teams participate in the global movement CanSat, under the supervision of national space agencies. The project has been active in Russia for four years now. By participating in CanSat Russia, high-school students can master primary professional skills for microcontroller programming, engineering design, receipt and transmission of telemetric data over radio channels. They learn to design, assemble, programme, test and launch to an altitude of 1-2 km, on a special rocket, a working model of a satellite that will perform a special scientific agenda while descending. A training CanSat satellite is equipped with all systems a real space apparatus may have.

In 2014, a new project started, called Aerospace School, which is a continuation and extension of CanSat Russia:

GIRD 2 contest: designing rockets and other carriers for launching school satellites.

Copter contest: design of miniature loads for unmanned aircraft (drones).

Contests for advanced participants, including:

Premier League: designing aircraft weighing up to 1 kg and with more complex tasks;

Superpremier League: designing aircraft to be launched to an altitude of 30 km.

## SOLAR SAILING RACE

Participate: <http://russiansolar.ru/>

The project is aimed at developing project-focused education for engineers in dedicated Russian schools. At the engineering competitions, teams of students of various specialties from Russian technical schools design, assemble and test motor boats powered by solar batteries.

In 2014, Sports Complex Luzhniki held Russia's first competition of motor boat models propelled by solar energy. Ten teams competed. In 2015, besides the competition between motor boat models, Solar Sailing Race is holding a 41-day expedition of a solar-powered boat along central Russia's rivers, without a single drop of fuel.

## ELEVATOR TO THE FUTURE

Participate: <http://lifttothefuture.ru/>

This all-Russian programme to work with gifted children and young people is designed for students of high schools, universities and vocational schools. The project involves:

All-Russian internet portal Elevator to the Future, an interactive platform for projects carried out by high school and university students under the guidance of supervisors; an open educational environment. Interactive centre of career guidance, career planning and employment for participants in the Programme.

All-Russian competition of regional high-school projects Priority System. Projects are accepted in the following nominations: health, medicine and biotechnology; telecommunication technologies; transport; innovative industrial technologies and materials; environment and natural resources utilization; power engineering.

All-Russian scientific and educational schools Elevator to the Future are an annual educational project for high-school students (students of 7-11 grades). At the school, children will have an opportunity to learn skills necessary for successful implementation of their ideas, discuss their projects with leading representatives of the scientific community and business, and devise a future action plan under the guidance of the programme supervisors.

## ROBOTICS PROGRAMME

Educational robotics is one of the fastest-growing applied fields in education. The programme already covers 36 regions of the country.

Robotics programme of Oleg Deripaska's Free Business foundation.

Participate: [www.russianrobotics.ru](http://www.russianrobotics.ru)

The programme entitled *Robotics: Engineering and Technical Human Resources of Innovative Russia* was launched in 2008 and is aimed at involving children and youth between 8 and 30 years of age in technical creativity, bringing up engineering culture, identifying and promoting promising engineering and technology specialists. The driving force behind the programme is the system of engineering and technology competitions ending with the All-Russian robotics festival RoboFest, which is at the same time the national selection stage for a number of international competitions in robotics: FIRST, WRO, ABU ROBOCON, ELROB.

## UNDERWATER ROBOTICS

(career guidance for schoolchildren in marine instrumentation).

Participate: <http://robocenter.org>

In 2013, the Centre for Robotics Promotion was established in Primorsky Territory. The Centre organized groups in six schools of Vladivostok for children between ages 5 and 17. The Centre prepares teams of high-school and university students for international contests and competitions in robotics (land, air and underwater).

Research and development activities in underwater and extreme robotics includes conducting research in the design and application of unmanned robotic devices in Arctic environments to ensure navigational safety. Teams of Far East schools regularly take part in Russian and global competitions in underwater robotics, invariably winning prizes.

## WORLD SKILLS RUSSIA

Participate: [www.worldskills.ru](http://www.worldskills.ru)

WorldSkills Russia is a Russian movement within the international organization WorldSkills International (WSI). WorldSkills is international competition in professional skills for young people aged 16 to 25, at which schoolchildren and students of vocational and higher educational institutions compete in dozens of competencies, from welding to cooking, to robotics, to aerospace engineering.

Today, 72 countries take part in the WSI movement. WorldSkills Russia championships were held in 45 Russian regions, including seven open championships, two annual national championships, the WorldSkills Hi-Tech contest between Russian industrial enterprises, and the Junior Skills championship among schoolchildren aged 10 to 17.

Winners of WorldSkills Russia represent our country at finals of EuroSkills and WorldSkills International.

Over the two years after Russia entered WSI, over 5,000 contestants took part in WorldSkills Russia contests, visited by 6,000 Russian and 70 international experts, and over 300,000 viewers.

# MY PERSONAL ACADEMIC PATHWAY

Send your comments and inquiries to: [atlas@refuture.me](mailto:atlas@refuture.me)

# Atlas of Emerging Jobs

Second Edition

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