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### **The impact feminism does on the modern society**

Nowadays, feminism is a quite widespread and popular movement that aims to define and establish the political, economic, personal, and social equality of both female and male sexes. In everyday life many of people are struggling with the stereotypes and restrictions based on one's gender, which we find completely unacceptable. Feminism is trying to fight for the rights of women and break down the stereotypes, but some people often substitute concepts and depreciate the feminists' job. That is why we are willing to explain the impact of feminism and maybe change people's minds on that subject.

Most people currently hold the opinion that feminism has outlived itself and is no longer needed by society. Women have already received equal rights with men, and the issue of gender equality can finally be considered closed. But if the movement still exists, it means that some problems have remained unresolved. So, for instance, some of the most pressing issues modern women struggle with are sexual harassment, domestic violence, the pay gap between men and women, eating disorders and body image, sexual and reproductive rights, honour crimes and female genital mutilation.

Sexual harassment is, unfortunately, quite common problem which women could face in the wide variety of settings: it could happen in the childhood, at the school, streets or even workplace. Sexual harassment can take different shapes such as unwelcome touching, gesturing, commenting and other physical interacting of many kinds. Regarding of this, the statistics say that 97% of women has ever been harassed, which is still not quite accurate accounting how many of them are scared to talk.

The problem of domestic violence in general is even more taboo, especially in Russia. At the legislative level, only administrative punishment of the rapist in the form of a fine is fixed. Women have already been afraid to seek help on their own, and now it seems almost impossible to get out of the cycle of domestic violence. This happens due to the social attitude so-called "do not take out the trash from the hut", as well as the pressure exerted on women by phrases like "beats means loves", "tolerates - loves", "beat a woman with a hammer, a woman will be gold", "if you want to live soul to soul, shake your wife like a pear" and so on, and also the opinion that it is important to endure for the sake of children or for the sake of literally anything else.

This is where the feminism is trying to help. Due to the lack of specific legislative enactments many social organizations were founded. For example, "Nasiliu.Net" (No To Violence) is a large project unique for Russia that is aiming to break the silence about domestic violence and make the problem visible. The Center is actively engaged in educational and informational activities, as well as targeted aid to survivors of domestic violence. Their job is to assist and support people in overcoming the traumatic experience and helping them to make a fresh start. The other center of such kind is "Sisters" - a center for helping survivors of sexual violence. An important distinguishing feature of both centers is providing help in the form of psychological assistance for both victims and the abusers. However, the main part about it is that they have to understand their issue and seek for that help, but that's how any therapy works.

Thus, it can be understood that with all the problems we have listed above, feminism is continuously fighting to this day. Gender discrimination, the problem of employment, education, rape and emotional abuse – all this is just the tip of the iceberg. The significance of my work is to disseminate relevant objective information about feminism and the ideas of feminism to establish equal rights and opportunities in society.

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### **Multiplexers and their application in everyday life**

Our time is considered an era of technological discoveries, so the science of the world does not stand still but moves forward, opening up new opportunities for humanity. Every year the devices become more and more complex in their design and special devices called multiplexers and demultiplexers are used to facilitate their already large functions.

Multiplexers are devices that allow you to connect multiple inputs to one output. Modular multiplexers are very popular. These are modern designs of devices that have a certain number of replaceable modules. With the help of such replaceable modules, it is possible to change the configuration of the multiplexer, in accordance with the user's requirements and conditions of use.

Such a switch will work equally well with both analog and digital signals. However, the speed of mechanical keys leaves much to be desired, and keys often have to be controlled automatically using some scheme. In digital circuits, it is required to manage keys using logical levels. That is, you need to choose a device that could perform the functions of an electronic key with electronic control of a digital signal. The structure of the multiplexer can be considered by the example of its general scheme. The input data of the logical type is received at the outputs of the switchboard, and then sent through it to the output. The words of the address channels are fed to the control input. The device itself may also have a special control input, which makes it possible to pass or not pass the input channel to the output. There are types of multiplexers that have a three-state output. All the nuances of the multiplexer depend on its model.

In general, the principle of operation of the multiplexer can be explained by the example of a switch that connects the inputs to the output of the device. The operation of the switch is provided on the basis of a control circuit in which there are address and permission inputs. The signals from the address inputs indicate which information channel is connected to the output.

Resolving inputs are used to increase the possibilities – increasing the bit depth, synchronization with the operation of other mechanisms, etc. To create a multiplexer control circuit, an address decoder is usually used. Consider the process of multiplexing several channels with different wavelengths. Optical signals arrive at the focusing plate, on which they are focused and interfered. A multiplex signal is generated at the output, propagating simultaneously along all tracks of the waveguide array. The waveguide lens focuses this signal into an optical fiber for subsequent transmission over a fiber-optic communication line. Light radiation at all wavelengths travels the same path through an array of waveguides. Therefore, the introduced attenuation for multiplexers at any wavelength is the same and amounts to 5-7 dB.

Multiplexers that support audio and video signal transmission are used on television, on monitors and in surveillance cameras. This is their main area of application, but do not forget about their other capabilities. Based on these devices, GSM modules and various Internet modems are located, transmitting a signal on a high-speed connection, providing the owner with a high-quality, stable network.

In addition, these devices are used in GPS receivers, fiber-optic broadband networks. In total, these capabilities give the multiplexer a huge scope of application, from federal television to conventional home broadband Internet. In conventional digital traffic transmission systems over optical fiber, it is possible to transmit only one data channel over a pair of optical fibers. The installation of multiplexers allows you to organize the transmission of up to 96 channels over the same two fibers. A huge increase in productivity contributes to the popularity of this equipment among telecom operators, Internet service providers, owners of multiservice networks.

The use of multiplexing systems eliminates the need for a constant increase in the capacity of fiber-optic cables and the cost of their purchase and laying. The advantages of the solution are especially pronounced on extended fiber optic lines laid in inaccessible terrain. With an increase in the volume of transmitted traffic, it is enough to install multiplexers to increase the throughput tenfold.

Multiplexers are devices that allow you to connect multiple inputs to one output. Demultiplexers are devices that allow you to connect one input to several outputs. In the simplest case, such switching can be carried out using keys: Such a switch will work equally well with both analog and digital signals. However, the speed of mechanical keys leaves much to be desired, and keys often have to be controlled automatically using some digital circuits, it is required to manage keys using logical levels.

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### **Electronic warfare systems. History and application of systems of radio-electronic warfare**

The basis of command and control systems for troops and weapons of all types the armed forces of modern states at the present time put radio-electronic means (RES). The most widely such means are used in aviation, air defense and missile defense, in the navy. Modern electronic missile and barrel weapon control systems are of great importance significantly increased the probability of hitting any aircrafts, surface vessels and ground objects [1].

Integrated use of methods and means of reconnaissance, radio communications counter measures and means of countering radio counter measures are called radioelectronic warfare. Success in such a struggle is achieved by superiority over the enemy in terms of quantity and quality of electronic technology, the possibility of its use in combat, providing stealth work and suddenness of action [1].

Electronic warfare also known EW is a type of armed struggle, during which the enemy's electronic control, communications and reconnaissance means are affected by radio emission (radio interference) in order to change the quality of military information circulating in them, protect their systems from such effects, as well as change the conditions (properties environment) propagation of radio waves.

Electronic warfare is primarily a means not of aggression, but of defense. Electronic warfare systems are used not only in military practice, but also to protect critical civilian facilities. For example, such as nuclear power plants. Electronic warfare is used during major events to counter international terrorism - world summits, meetings of leaders of countries, the Olympic Games, football championships and others [2].

The first officially recorded case of the use of radio interference in combat operations was the confrontation between Russian and Japanese radio operators during the defense of Port Arthur in 1904. Then two Japanese cruisers, having taken advantageous positions, began using the telegraph to direct Japanese artillery at Russian targets. In order to prevent them, as Rear Admiral Ukhtomsky, commander of the Pacific Fleet, reported afterward, "immediately, the battleship Victory and the Golden Mountain stations began to interrupt enemy telegrams with a big spark." As a result of the actions of Russian radio operators, not one of the 208 large-caliber shells of the Japanese fleet hit the target [2].

The targets of radio interference are radio links for communication, control, guidance and navigation. Interference mainly affects the receiving part of radio equipment. Active and passive means are used to create radio interference. Active media are those that use the generation principle to create radiation (e.g. transmitters, jammers). Passive means - use the principle of reflection (re-emission) (for example, corner and dipole reflectors, etc.).

EW systems consist of several parts such as electronic countermeasures, electronic protection, electronic intelligence and electromagnetic destruction.

Suppression consists in disrupting or reducing the effectiveness of enemy electronic systems. Includes radio engineering, radio engineering, optoelectronic and hydro acoustic suppression. This can be active and passive interference, the use of decoys, traps and other methods. The development of means of electronic suppression is carried out in close cooperation with the development of radar technology and characterized by constant technical and scientific confrontation [1].

Electronic protection is an integral part of the means of electronic warfare, aimed at ensuring the stable operation of electronic means (RES) under the influence of intentional enemy radio interference, electromagnetic radiation from a weapon of functional destruction, electromagnetic and ionizing radiation arising from the use of nuclear weapons, as well as under the influence of unintentional radio interference [3].

Electronic intelligence is the collection of intelligence information based on the reception and analysis of electromagnetic radiation. Electronic reconnaissance uses both the interception of signals to detect communications between people and technical means, and the possibility of using radar, monitoring radio interference and other electronic means [3].

Electromagnetic defeat is an electromagnetic impact (impulse) that disables the radio engineering, communication and power equipment of the enemy. The striking effect is achieved by induction of induction currents. This was first noted during nuclear explosions in the atmosphere [4].

Currently, magnetrons are used to create a damaging pulse. Electromagnetic destruction systems are in service with the United States and other NATO countries [4].

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### **The history of headphones development**

At the end of the XIX century, sound recording began to take its first steps. The world eagerly and enthusiastically absorbed new musical trends and took timid steps to develop the technical component of music.

The hard work of telephone operators in the middle of the XIX century provided for constant interaction with the transmitter and receiver of sound. In 1881, the assistant of the telephone company Bella Ezra Gilliland suggests fixing the parts of the phone to a metal rod, fixing a 3-kilogram structure consisting of a microphone and a speaker on the head. This decision marked the beginning of the evolution of headphones, and the invention of Gilliland became the first telephone headset.

In 1891, French engineer Ernest Mercadier patented a set of plug-in headphones - the "great-grandfathers" of modern earbuds. The design of the headphones became revolutionary for that time – miniature button headphones with a rubber cap that protects the auricle from irritation and, at the same time, is used as noise reduction.

Another attempt to create a prototype of in-ear headphones belongs to the famous inventor Thomas Edison. In 1895, he patented a device called the "kinetophone". The patented device was able to reproduce sound and cinema at the same time. Its principle of operation was based on the transmission of sound from a phonograph through hollow tubes directly into the ear canal. It was based on a medical stethoscope and no electronics.

Throughout the history of technology development, the first industry to receive the latest inventions and "technical breakthroughs" has always been the military industry. In 1910, Nathaniel Baldwin offered the US Air Force several drawings describing the design of headsets. The first model of headphones provided for the placement of an arc over the head, and not in the neck area. A few years later, it was the model proposed by Baldwin that became the main means of communication for all operators of the Navy.

The heavy-weight design of the headphones has undergone several more changes, the headband has received a skin-tight fit and size adjustment. The improvement in the design of headphones brought Baldwin the title of "father" of all modern headphones.

In 1921, a serial model of the Western Electric radio receiver entered the US market. Included with the device, the buyer received high-resistance headphones CW-834.

In the thirties of the XX century, headphones were widely used for communication. Popular entertainment programs on the radio preferred to listen to it with headphones. At the same time, their design and technical characteristics were far from perfect. The headphones did a great job with speech, but things were really bad with music. The 18-year-old Eugen Bayer, a native of Sweden, who took on the role of an audio technology revolutionary, decided to radically change the situation.

In 1926, Bayer founded the company Elektrotechnische Fabrik Eugen Beyer. Microphones remained the company's priority product for a long time, but in 1937 Bayer decided to release headphones.

But the company that really managed to shake up the world and release headphones "for everyone" was originally engaged in TV rental. In 1958, John Koss presented a portable vinyl player at the Consumer Electronics Show. In fact, the device was a traditional turntable installed in a suitcase. Headphones were also supplied with the player, for the manufacture of which John Koss and Martin Lange used a model of standard aviation headsets. Armed with parts from an old TV, the inventors managed to transform the sound quality.

Nobody was particularly interested in the player itself, but the sound of the headphones managed to impress all the visitors present at the exhibition. Realizing that the headphones have a great future,

John Koss released the first production model Koss SP-3.

It was the Koss SP-3 model that became the prototype of modern in-ear headphones. The direction of sound in the SP-3 was carried out not into the auricle, but into the ear canal. The success of the first production model of Koss headphones made it practically a monopolist in the market. By 1967, the company's turnover exceeded \$1 million. Later, in 1983, another legendary Koss Porta Pro model entered the market.

The category of electrostatic headphones was first introduced by the Japanese company Stax in 1959. Stax headphones cannot be bought in a regular home appliance store, portable players are never equipped with them. These headphones were originally created for a narrow audience of professionals.

The use of an ultra-thin membrane placed between two electrodes and a high-voltage amplifier cause sound vibration with a minimum level of harmonic distortion and enviable sensitivity. Due to the high price, the mass market is not ready for such a model even today, although the sound of electrostatic headphones is close to the standard.

Koss later gave its answer to Stax by releasing a model of Koss ESP-6 electrostatic headphones.

In 1964, Beyerdynamic released the DT 507 plug-in earphone, which weighs only 11 grams. It was supplied complete with a branded radio receiver. A year later, the "smallest radio receiver" appeared in the USSR, a dual-band "Micro", the size of which did not exceed a matchbox.

The "Micro" was equipped with a miniature TM-2M mono earphone with several rubber nozzles and a flexible earpiece.

Up until 1968, the entire range of headphones was represented exclusively by closed-type models. Only one person could hear the music, and all the sound remained in the "shell" of the earphone. The driver closed on the back of the ear not only completely isolated the music, but also made the headphones heavy and bulky. The German company Sennheiser decided to significantly simplify the design and open the driver.

The first headphones with an open design was the Sennheiser HD 414 model.

Having received a patent for open-type headphones in the distant 60s, Sennheiser continues to receive lifetime deductions from each brand that produces this type of headphones.

Sony also managed to support the hysteria around the mass use of headphones. In 1979, the first portable Walkman player entered the market. Sony MDL-3L2 headphones became its main partner.

The use of noise reduction systems in aviation could not but affect the scope of headphones for ordinary consumers. Since 1986, Bose has become one of the largest suppliers of headphones with an active noise reduction system for pilots. The company's patented QuietComfort system, used in headphones, reached the mass market only in 2000.

The appearance of the first wireless headphones can be attributed back to the early nineties, when Koss announced a model that allows using an infrared beam to connect to an amplifier or a sound source using the included set-top box.

The idea of wireless headphones was immediately picked up by Recoton, presenting a model of headphones operating at a frequency of 900 MHz and having a range of up to 45 meters.

In 1997, Recoton received a refusal from the UK government to produce wireless headphones operating at a frequency of 900 MHz, due to the fact that this wavelength is already in use. In search of comfort and an alternative technology for abandoning wires, in 1998, manufacturers opened up new opportunities for broadcasting "sound without wires" – Bluetooth.

In 2004, the first Bluetooth i-PHONO BT420EX wireless headphones with their own transmitter entered the market. A year later, the first headphones using a wireless Wi-Fi network for sound transmission began to appear on the market.

Today, manufacturers will continue to make history by creating new extraordinary solutions to the realization of exactly how headphones should look.

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### Designing a Use Case Diagram with UML

Application development involves two actors: client (specific person, or group of people, or organization) and developer. Because there are two characters, a lot depends on the degree of their mutual understanding. Therefore, one of the key stages of application development is to determine what the application being developed should do. Usually, when designing information systems, developers depict the system using various diagrams, since it is easy for a person to understand such a representation.

Unified Modeling Language (UML) –graphical description language intended for modeling. With the UML language, you can represent any process in diagrams, which, depending on the situation, are able to describe various actions.

In order to describe the different groups of users and their capabilities in the future program, a so-called use case diagram is created. Use case diagram – a diagram showing the relationships that exist between actors and their use cases. Let's take a closer look at a specific example. We decide an information system to support learning to solve tasks in a physics course and design a use case diagram.

Each user group in the use case diagram is represented by a stickman, under which is written the name of the group of people it represents. In UML terminology, this stickman is called an actor. Let's depict the user groups «Teachers», «Students» and «System»(Figure 1):



Figure 1: Actors

In the use case diagram, a system function is represented by an ellipse, inside which the function name is written in the form of a verb with explanatory words. In UML terminology, this ellipse is called a use case. For example (Figure 2):

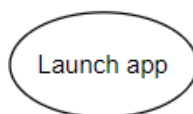


Figure2:Use case

On the designing diagram, it is necessary to show such elements as:

- Character or actor. The actors in this information system will be the users of the information system - this is a student and a teacher, and the system itself, which performs the necessary functions.
- Use cases. They are a sequence of actions performed by the system in response to an event initiated by an object, that is a user or the system.

The main use cases that are initiated by the student are: launch app, view educational literature, log in/register, choose tasks.

The main use cases that are initiated by the teacher are: launch app, view educational literature, log in/register, add tasks.

And the main use cases that are executed in response to an event initiated by the system are: check stages of solution, show information about the correct / incorrect answer, and write data to database.



Based on this data, you can proceed to design a use case diagram. The design result is shown on Figure 3.

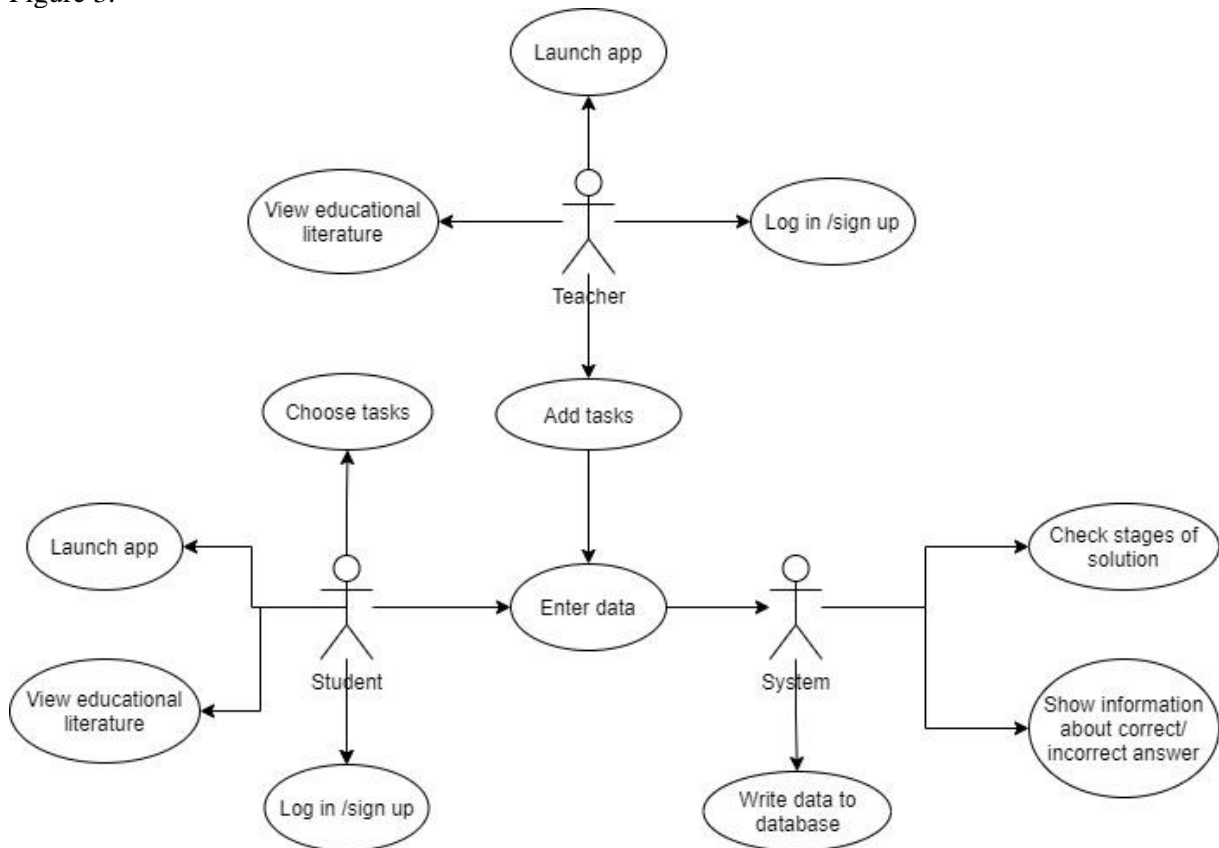


Figure3: Use case diagram

So, I tried to tell you about designing a use case diagram at the design stage of information systems.

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### **Smart home: advantages and disadvantages**

The current state of the economy is characterized by the active development of digital tools that penetrate into all spheres of human life. The most popular tools of the digital economy are the Internet of Things, artificial intelligence and others [5].

The most priority areas for the development of the Internet of Things are Smart Home and Smart City.

A smart home is a technology that allows a person to control a system that includes various tools that increase the level of comfort and safety of human life [6].

This article is intended for a wide range of people and does not contain technical details that are understandable only to a specialist. In our country, "smart" houses and "smart" apartments are not yet a common phenomenon, although in many other countries home automation has become a common phenomenon[1].

There is only one important thing to consider. The level of the automation system is determined not by the manufacturer's brand, but by the system architecture and algorithms embedded in the software. The more intelligent the software is, the more capable it is of learning and tuning, the greater the result we will get[1].

To understand whether it is necessary or not to use the Smart Home system in your home or apartment, you should first of all study the possibilities offered by this system. Correlate advantages and disadvantages.

#### Advantages of "smart home"

Different people come to the idea in absolutely different ways that it is necessary to install a home automation system in a new or existing apartment. Some are driven by the desire to use the most modern novelties, others want to surprise their guests. And some people objectively consider the advantages of a "smart home". Let's look at what the installation of automation systems gives[1].

1. Automation allows you to save money. This refers to the efficiency of the engineering systems of the house and your household. The automation system is able to control many devices at the touch of a button, can control thermostats and turn off the light where it is not needed, or where it was forgotten to turn off. Thus, we spend less electricity and gas if it is used for heating, and we protect the resources of the planet for our descendants.

2. Automated house is more convenient. A person is able to control and control all types of electronic devices (lighting, heating and air conditioning, audio and video equipment, motorized drives, security system, etc.) from the screen of a smartphone or tablet. Convenience alone is enough to inspire a lot of people to automate their home. We can show our friends how easy it is to manage various engineering systems.

3. Automation creates comfort. Thanks to the ability to actively control and control various electronic elements, the automation system guarantees maximum comfort. The entire environment - from controlling the light and maintaining an optimal temperature, to playing your favorite music is controlled by a control system that gradually learns the way of life of a person.

4. Automation increases safety. A home automation system helps prevent potentially bad things by allowing you to control your home remotely using smartphones and other devices. It is also possible to control the house even when we are far away. The smart home system can monitor the condition and location of residents and typical scenarios of their behavior. I would like to note that many security systems have the basic functions of a home automation system. Safety is always important, in addition, a person will be able to gradually accustom the residents of his house to use modern technologies [2].

### Vulnerabilities of the Smart Home system

When analyzing the vulnerabilities of the Smart Home system, the following was revealed:

1. Currently, during the development of computer technologies, identification and authentication data can be intercepted by third parties through the introduction of malicious software into the devices of the Smart Home system.

2. Full-fledged antivirus systems providing comprehensive protection against malicious software developed specifically for smart home systems do not yet exist.[3] Moreover, the program code peculiar to viruses for Smart Home systems is not recognized by most signature scanners [4].

3. The use of symmetric cryptographic systems, remote control of devices, updating the software of devices, the predominant use of wireless communication to communicate devices with each other - all this requires the presence of secure communication channels in the Smart Home system.

4. Potential vulnerabilities of the Smart Home system due to the functioning of devices from different manufacturers in it.

5. Finally, the devices of the Smart Home system have different functionality and a set of tasks to be performed. Accordingly, the devices have various vulnerabilities.

In conclusion, I note that the advantages of a smart home are still more than the disadvantages. Although the technology is actively developing, it is still poorly distributed. For example, in America, Smart House is installed in 20% of homes, and even less in our country. A smart home significantly increases the comfort and safety of living, simplifies the performance of some household operations, helps to save money. Installing a Smart House or coping with household chores yourself is the choice of each person. The system is constantly being improved. Specialists are working on eliminating shortcomings, developing new functions and options. This objective trend is gaining momentum.[7]

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## Web Developers

The most popular of programmers are people who are engaged in the development, design or promotion of websites - web programmers. Web development of websites, mobile applications and services is a popular direction in the field of IT. There are a lot of people in this specialty, but it is relatively easy for them to find a job.

What are the main reasons why web developers will remain popular in the near future.

### 1. Lack of IT specialists

According to dp.ru, there are not enough IT specialists in Russia. Their share of the economically active population is 2.4%, which is almost three times less than that of Finland, our neighbor. Analysts predict that in 4 years the need for qualified IT workers will increase to 300,000 people per year.

### 2. The variety of web developers on the market

Everyone should do what suits him best. There are three directions in this industry:

Backend developer - this is a specialist who deals with the software and administrative part of a web application, the internal content of the system, server technologies - database, architecture, software logic.

Frontend developer is a specialist who is responsible for creating the user interface of a website, application or software.

If the Backend developer is the one who does what is "under the hood" on the web server, then the Frontend developer does what the user sees in the browser and interacts with when he enters data and receives feedback.

Fullstack. Understands frontend and backend at the same time. They are also called full-cycle developers.

Each person can choose their own direction. Web development is quite easy and quick to learn, it is a profession that is directly related to the study of libraries (ready-made code) and tools, where your growth is compared with your knowledge and where your demand depends on this knowledge.

### 3. The popularity of programming languages

Web development is divided into several programming languages. Each language is more or less responsible for its task with its own. The most popular are JavaScript, PHP, Java, HTML and CSS, SQL, Python, C, C++, Ruby, Go.

JavaScript is a programming language for writing frontend and backend parts of websites.

PHP is needed to write programs that run on the server and perform various server tasks, such as sending mail, interacting with the database, etc.

Java is especially popular in the financial sector, as it is used to create reliable websites whose servers should not be affected by a large number of requests.

HTML is a standardized document markup language for viewing web pages in a browser. It is needed to display in the browser a specially formatted document with many nested elements: headers, paragraphs, lists, hyperlinks, media sources, the location of images, video and audio.

CSS is a style sheet language that allows you to change font styles, text and color of structured documents such as HTML.

SQL is a declarative programming language used to create, modify and manage data in a relational database managed by a corresponding database management system.

### 4. Demand in business

Rosstat assures that 81% of all Russians use the Internet — that's about 118 million people. The presence of such a number of potential buyers can turn the head of every entrepreneur. In accordance with this, they have a need to create their own Internet resource. According to statistics, 54.4% of

able-bodied Russians are buyers of online stores, which makes the Internet one of the main tools in market relations between people.

#### 5. Every year it gets easier

Every year we release and create new tools and libraries for website development, which in turn greatly simplifies the life of the developer and makes the process of creating a website much more interesting and easier. And due to the growing polarity of the Internet and its role in the marriage of people, many companies that have developed languages in which web development is carried out do not lose their relevance and continue to develop in big steps.

In the nearest future, web developers will be the most relevant vacancy, depending on the level of the specialist, the salary in Russia varies from 50 to 250 thousand rubles, which is one of the indicators of demand and relevance in the labor market of web developers. There are no opposite prerequisites for the demand for web development specialists. Almost everyone uses websites, social networks, applications, services, and the growth will only continue.

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### **Production of chip crystals**

Modern microchips are striking in their complexity. Probably, these are the highest technological achievements of human civilization today. They are present in absolutely every electronic device, and without them they will not work. But all microcircuits also consist of something, and their main component is a substrate made of a semiconductor crystal.

The most commonly used crystal is monocrystalline silicon (Si), because it has many advantages: the microcircuits on it have small reverse currents, operate at elevated temperatures, allow higher specific loads, can work in the field of electrical breakdown of the p-n junction.

Chip crystals must be produced in controlled and very clean air conditions. Since the functional elements (transistors, conductors) on microchips are very small, any foreign particle (dust, smoke or skin flakes) that gets on the plate with future microcircuits at the intermediate stages of its production can disable the whole crystal. Such rooms are called "clean rooms".

The most common process of producing crystals for microcircuits is called photolithography. It consists in the fact that the necessary material is deposited immediately on the entire surface of the substrate, and then it is carefully removed from those places where it is not needed. First of all, a thin and solid layer of the desired material is created on the substrate in one way or another. Then photolithography is carried out on it. To do this, first a thin layer of photosensitive material called a photoresist is applied to the surface of the plate, then the plate with it is placed in a precision installation, where the desired areas of the surface are irradiated with ultraviolet light through transparent holes in the photomask. The mask contains a corresponding pattern that is developed for each layer during the chip design process. Under the action of ultraviolet radiation, the irradiated areas of the photoresist change their properties so that it becomes possible to selectively remove them in certain chemical reagents. One photoresist "grows stronger" during irradiation, so its non-irradiated areas are removed, and the other, on the contrary, loses its chemical resistance, so its irradiated areas are removed. After removing the photoresist, only those areas of the plate surface remain open over which the necessary operation is required — for example, to remove a layer of dielectric or metal. They are successfully removed, after which the remains of the photoresist can be finally removed from the surface of the plate, exposing the pattern formed in the layer of the desired material for further action. The photolithography is completed.

In the production of modern microprocessors, it is necessary to perform photolithography operations up to 20-25 times — each time over a new layer. In total, it takes several weeks! In some cases, these are layers of insulating materials that serve as the gate dielectric of transistors or insulating layers between transistors and conductors. In others, it is the formation of conductive polysilicon gates of transistors and metal conductors connecting transistors.

Sometimes such an interesting method as explosive photolithography is also used. First, a pattern is formed, then a solid layer of a new material (for example, metal) is applied to the surface of the plate, and finally, the plate is placed in a reagent that removes the remnants of the photoresist or a temporary dielectric. As a result, the layer being removed seems to "explode" from the inside, taking with it the pieces of metal deposited by the latter lying on it, and in the previously "open" sections the metal remained and formed the functional one we need.

After the technological procedures are completed, each of the crystals on the plate is tested, and then the plate is cut into individual crystals (rectangular chips) using a diamond saw. This allows them to be placed in more compact enclosures. Next, each chip is packaged in its own case, which allows it to be connected to other devices. Finally, all packaged chips are tested again, sorted by characteristics and compliance with certain specifications and shipped to the customer.