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MARKETING RESEARCH OF THE MARKET OF TECHNOLOGIES OF VIRTUAL AND ADDITIONAL REALITY IN UKRAINE

The article deals with the types and properties of modern technologies of virtual and additional reality. The development and trends of the world market of virtual and additional reality are analyzed. A market research of consumers in the form of a survey was conducted to determine the tendencies of the Ukrainian virtual and additional reality technologies market. According to its results, three groups of consumers were distinguished, differing in knowledge, attitude and technology evaluations: neutral, skeptics and innovators. Two latent factors that have an impact on consumer behavior were allocated: conservatism and liberalism.

Key words: marketing research, technology of additional reality, technology of virtual reality, questionnaire survey, cluster analysis, factor analysis.

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Statement of the problem in general form and it's connection with important scientific or practical tasks. The fourth industrial revolution brings to life a huge number of technological novelties. One of such technological novelties are VR / AR technologies.

For a long time, only developers of games paid attention to technologies and products of virtual reality (VR). Indeed, VR has all the properties for full «absorption» of the user. But, it's time that marketers pay attention to this product. To create a progressive and modern society, new products of VR-products should appear on the Ukrainian market, applications and software that will remain in Ukraine will be created, and not go to foreign markets. If considered in the long term, then VR-helmets are a great way for a marketing strategy. We also want to note that the query «virtual reality» was indexed 3600 over the past month in Google UA.

A more interesting situation is with augmented reality (AR). It has a number of advantages, one of which is availability. Using the technology of augmented reality does not require now any additional gadgets. The development of accelerators in the field of creating products for AR should become one of the important directions in modern Ukraine. Already today, Ukrainian startups create books that support AR, this is an excellent tool for learning. Marketers also need to pay attention to it, because in the last month there were absolutely 1000 «Augmented Reality» queries in Google UA.

Thus, to promote new technologies and create a «boom» in Ukraine, it is necessary to recognize and study the target audience. Moreover, it is worthwhile to understand whether the Ukrainian audience is familiar with VR / AR products and is ready to accept new technologies.

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Analysis of the latest research and publications, which initiated the solution of this problem and on which the author relies. The study of consumer attitudes to VR / AR technologies – virtual / augmented reality considered in the reports of two world-famous analytical companies in the field of developing VR / AR media and software – Digi-Capital and Super Data Research. The companies provide consulting services in the area of analytics and development of VR / AR products. Their clients are global giants like Microsoft, Google, Apple, Facebook, Intel, nVidia, Disney, Sony, Sega, Wargaming and dozens of other equally well-known corporations.

Highlighting the previously unresolved parts of the general problem to which the article is devoted. The whole world follows and develops such a trend as the use of VR / AR products in everyday life. While the population of Ukraine is new to new technologies or unfamiliar at all. The problem is that because of ignorance of Ukrainians false opinions and myths about VR / AR technologies are born. Thus, Ukrainian marketers can miss the wave of «boom» of VR / AR technologies. After all, what was popular in the Western countries yesterday will definitely become a trend in Ukraine tomorrow.

Formulation of the purpose of the article (statement of the problem). The main goal of the marketing research is to study the target audience by using a survey and building mathematical models based on the responses to the survey. Based on the results, we will be able to understand the level of perception of VR / AR technologies by Ukrainians. For this, the following tasks solved:

- Collection of primary and secondary information about VR / AR products;
- Statement of hypotheses, choice of research method;
- Definition of the sample;
- Creating a questionnaire;
- Carrying out a survey;
- Data processing.

Statement of the main material of the research with full justification of the scientific results obtained. VR (virtual reality, virtual reality) is a world created by technical means (objects and subjects) transmitted to a person through his senses: sight, hearing, smell, touch, and others. Technology creates an impact and response to the impact in the virtual world [1].

Among the image reproduction systems in VR, the following types are distinguished:

1. Helmet or virtual reality glasses (HDM-display) – in most cases special glasses that contain several displays for the left and right eyes and a lens system for correcting the geometry of the image. Also the main component is the tracking system for helmets of virtual reality, which are developed with the help of magnetometers, gyroscopes and accelerometers.

2. Motion Parallax 3D displays is a technology that used for some applications in the smartphone and in virtual reality rooms (CAVE). The system helps to create the user's illusion of a 3D image due to special projections that generated based on information about the position of the user's eyes.

3. Sound generated through a multi-channel speaker system. It makes localization of the source of sound, which allowed the user to navigate the virtual world with the help of hearing.

4. Most often, tactile sensations transmitted with the help of gloves of virtual reality. Scientists from the University of California at San Diego developed them. Gloves reated from an exoskeleton, equipped with soft muscles. The system consists of the following components: Leap Motion (determines the position and movement of the user's hands), Mckibben muscles (response to movements created by moving the user's fingers) and a switchboard (controlling the muscles themselves, which create tactile sensations).

According to Nosov N.A., virtual reality has the following properties [2]:

- Generation – virtual reality produced by another reality external to it;
- Actuality – it is actual, now of observation «here and now»;
- Autonomy – has its own laws of being, time and space;
- Interactivity – can interact with other realities, nevertheless, having independence.

The market of virtual technologies divided into 2 large segments: software development (software, then software) and virtual reality playback systems.

The company SuperData Research conducted research in 2016 and created a forecast for the growth of the VR technology market. Data on the forecast of the market, its growth and cost seen on fig 1.

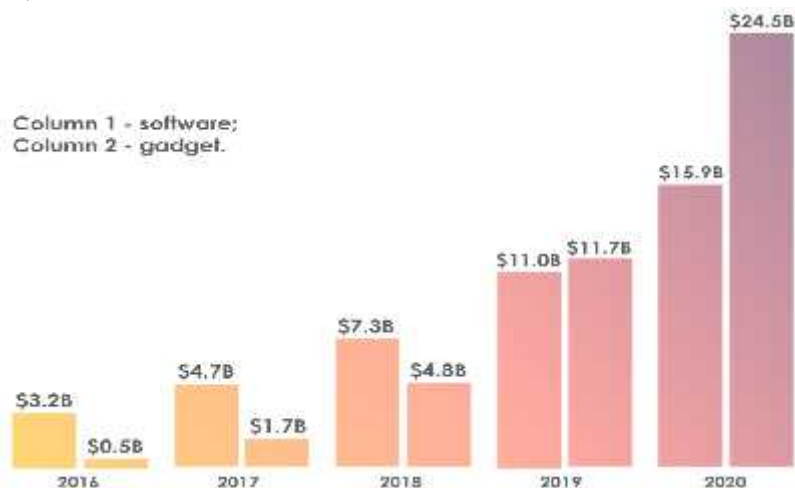


Figure 1 – Global VR market (media vs. software)

Source: Super Data Research [3]

The graph shows that in two segments of the virtual reality market (media and software) actively compete with each other. It concluded that now the important role played by the creation of media for the reconstruction of virtual reality, rather than programs. However, as the graph shows, the more carriers there are, the more diverse programs will need. Thus, if in 2016 the ratio of the market share of the carrier to the program was 6.4 to 1, then at the time of 2020 0.6 to 1. This is not counting that the volume of the software market will grow 50 times.

Also, the company has determined which VR market segments are most invested in venture capital funds. The market for software development in 2017 presented in fig 2.

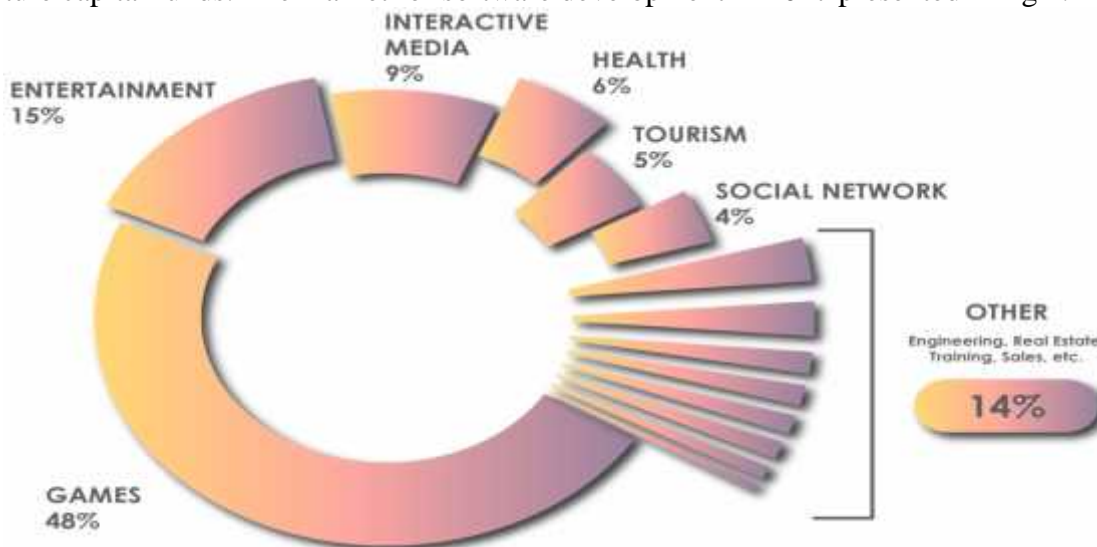


Figure 2 – The VR Software Market (Source: Super Data Research [3])

Other forecasts by Super Data say that by 2020 about 200 million homes will own at least one virtual reality device. It should also be noted that virtual reality programs work on three platforms: PC, Mobile, Console. The distribution of the market and the forecast for 2020 analyzed in fig 3.

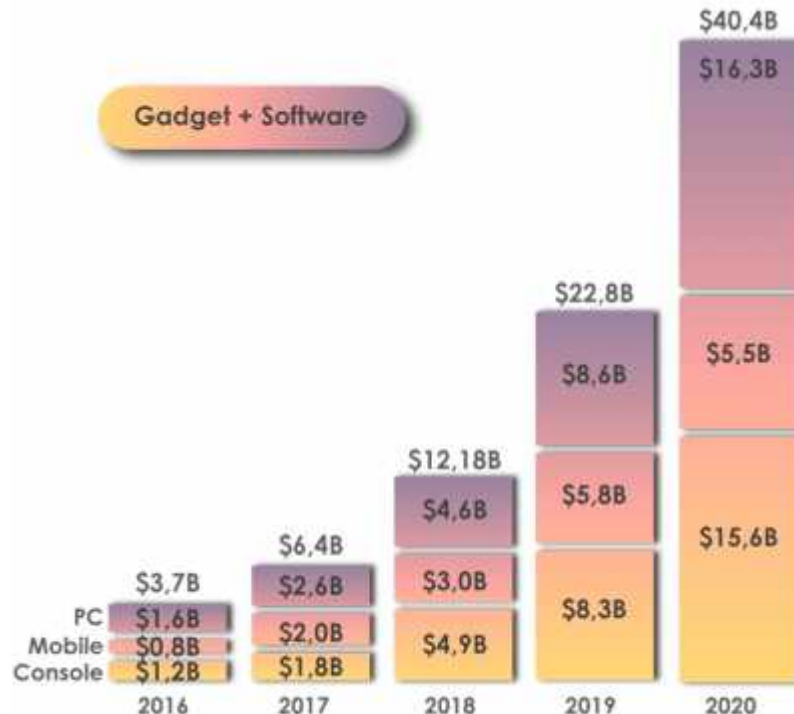


Figure 3 – Global Media Market VR
Source: Super Data Research [3]

According to the schedule, we see that all the devices will go toe-to-toe, but in 2016 there is a clear jump in the development of PC and Console. This is because the reproduction of virtual reality requires large capacities from the media, which cannot fully offer the segment of the Mobile market.

There are also a number of risks associated with virtual reality:

- Physical risk. The emergence of such a disease as cybernetics. The essence of the disease is that the visual and auditory sensors tell the consumer that it is moving, but the inner ear says that you are standing still. There is a conflict and the body begins to «defend». Headaches begin, nausea and disorientation in space;

- Security risk. The essence of the risk in the protection of information and messages. Some of the security concerns are related to features that allow virtual network owners to allow users to travel between different worlds or download their own content and have complex interactions;

- Behavioral risks. There are certain behavioral patterns. Virtual reality environments offer the same potential for rudeness, harassment and discrimination, like any other communication channel, while making interaction more real and personal.

- Risk of confidentiality. The whole world knows that with the help of targeting strategy you can change the world, get any data. More accurate, maximum reliable data obtained in virtual reality, because the basic behavioral models of the person be saved, the program will read them and send them to the right customer. In the end, this can lead to total control of almost everyone;

– Risk of losing money. Just recently, Facebook acquired Oculus Rift for \$ 2 billion. Not every company can afford it. The VR market is only now stabilizing. This confirms the semi presidential release of Samsung Gear VR. The company received 2 times less revenue than planned. This indicates. The market develops in its own plane very quickly, but in the world, it has more to work on. The following devices provide the VR market: Google Cardboard, Samsung Gear VR, Oculus Rift, HTC Vive, Sony PlayStation VR. Each of them occupies its own segment. However, the struggle for the consumer takes place in one huge market of virtual technologies. The number of VR-devices that sold in 2016-17 in terms of competitiveness analyzed on the fig. 4.

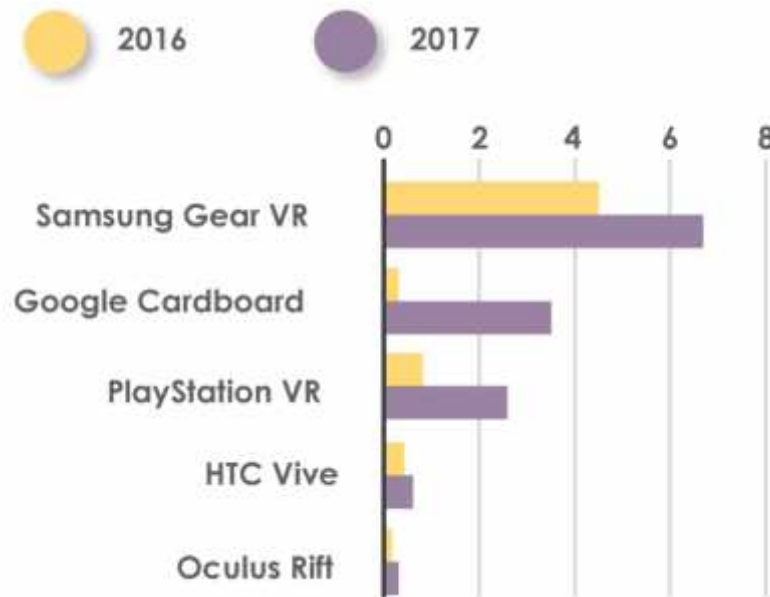


Figure 4 – Number of sold VR-devices for 2017, million
Source: The Economist [4]

A study by Super Data shows that Sony sold the largest number of VR devices. A little further from the world brand went no less well-known company Oculus and htc with the product htc Vive. But the market leaders are Google and Samsung. This feature related to the technical component of the devices and their availability. The fact is that 2 market leaders focused their attention not on powerful game consoles or computers, but on ordinary phones: no wires. It is only necessary to put the phone in the VR-device.

The sphere of application of VR-technologies on the world market:

- Entertainment;
- Art and design;
- Games;
- Training and simulation;
- Tourism;
- Psychology and meditation;
- Real estate and shopping;
- Social sphere.

Augmented reality (AR, «expanded reality») is the result of introducing any sensory data into the perception field in order to supplement information about the environment and improve the perception of information. In other words, this phenomenon is the integration of

the virtual world (digital world) with the real world here and now. AR played in two ways: special glasses or using phones [5].

Virtual reality glasses are glasses-computer. The user wears glasses and through the lens looks at the real world with superimposed reality and virtual objects superimposed on it. A special system built in the device, which monitors the movement of the eyes. In turn, the software summarizes the virtual and real picture. This allows you to create the illusion of a panorama – you can impose ancient locks on the city landscape, and you can view from depending on the rotation of the head.

Mobile devices have the greatest practical application now. The mobile phone or tablet camera sends the scanned image to the user's program of interest. The program recognizes the image, selects the points that it needs and reproduces it against the background of the camera image. A vivid example is the game Pokémon Go. The game brought the world to a mass panic. The essence of it is that in real time to catch Pokémon, which are found all over the world and can be anywhere. For this, only a phone needed. The camera scanned the cloud of points that sent from the central server, and when the camera player hovered the phone at that point, a pokemon appeared that caught.

The AR market divided into the following sectors:

- Production of displays: development of various types of devices and devices for AR;
- Developers of playback technologies: providing various solutions for the development of digital image processing, 3D reconstructions, etc;
- Application development: creation of technologies for the end user (games, social networks, training applications) and for the B2B market (marketing, retail, real estate).

On fig. 5, we see the AR-market growth forecast.

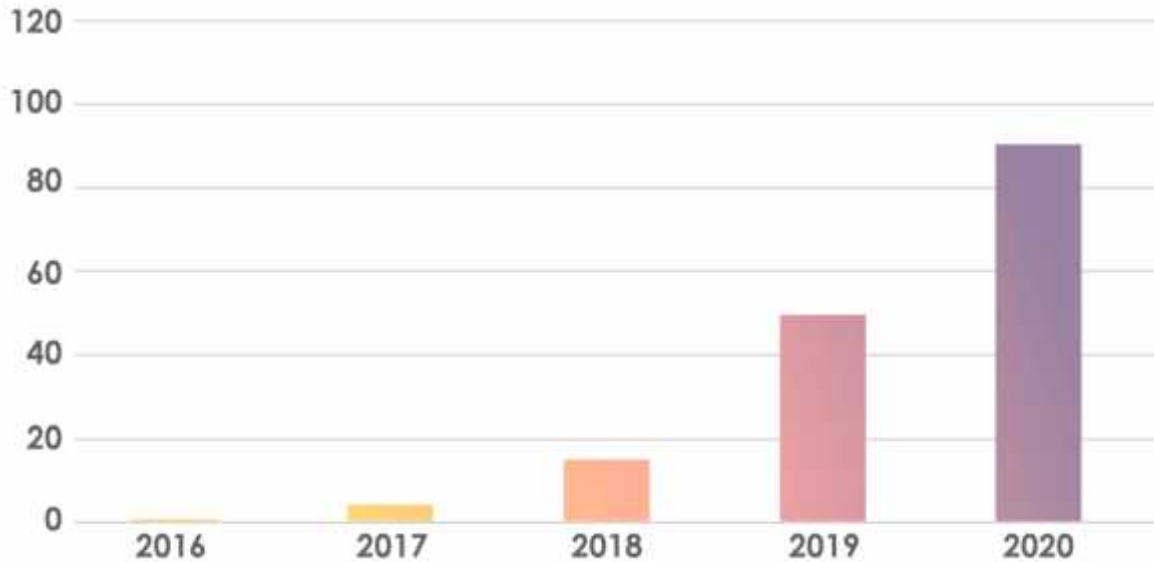


Figure 5 – Global AR market, billion
Source: The Economist [6]

We see that the market will grow exponentially. If in 2016 the market volume was just over one billion, then by the end of 2020 this amount will vary about \$ 90 billion or more.

As it said earlier, mobile applications of augmented reality are more accessible device. In fig 6, you can observe the increase in prices for mobile devices that support the technology of augmented reality.

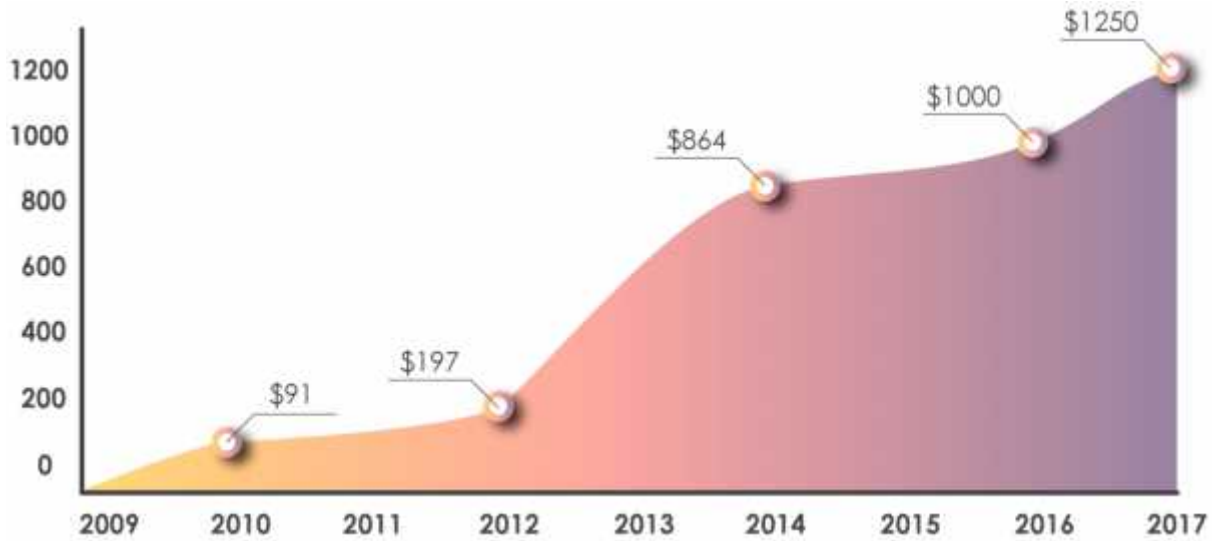


Figure 6 – Rise in prices for mobile AR-devices

Analyzing the studies of Bidness etc., we see that mobile devices with the ability to play augmented reality began to appear in 2010, and their price did not exceed \$ 200. Now, taking into account the latest developments, as well as considering the amendment to the brand, the cost of the latest model is \$ 1000 per unit. This cost claimed for the new Apple iPhone X from Apple. They have released a new platform ARKit, which makes a big breakthrough in the field of software. Fig. 7 shows the number of software AR installations and the purchase of AR devices.

Figure 7 – Demand for mobile AR and software
Source: Digi-Capital [7]

According to the schedule, we see that from year to year the consumer needs software more than devices. This is because the AR market was not ready for such an upsurge. The need for AR emerged only in 2016, and the developers did not sing to take it more thoroughly. This is due to the release and release of the aforementioned Pokémon Go. We can also look at the

opposite situation with the VR market. Indeed, right now the need for VR-devices is much greater than expected in the near future.

Accessibility in the development of AR-applications and the device generated a huge number of startups, in which the largest venture funds invested:

- Intel Capital financed 7 startups, the largest of which are Eyefluence and Occipital;
- Qualcomm Ventures also financed 7 startups. The most successful are Blippar, Navdy and Magic Leap;

- Rotheberg Ventures financed 6 startups. The largest are 8i and Augmate. The largest transactions in 2016 given to companies that develop AR-devices, applications for medicine and marketing. These companies are:

- Magic Leap (HMD Manufacturer) – \$ 794M, Series C from Google, Alibaba Group, Qualcomm Ventures, Warner Bros., Morgan Stanley, Fidelity, JP Morgan, T. Rowe Price, Wellington;

- MindMaze (Application - Medical) – \$ 100M, Series A from Hinduja Group;

- Blippar (Application - Marketing) – \$ 54M, Series D from Khazanah Nasional Berhad and from other investors. By 2022, the software market for AR-devices will be equal to 80-90 billion US dollars. The main vector in the sphere are games. They occupy a third of the total market. The reason for this demand for AR is its multifunctionality and the possibility of application in all spheres of human activity.

Conclusions.

Analyzing the VR / AR market, we can conclude that the technologies are advanced and innovative. Comparison of market shares analyzed on fig. 8.

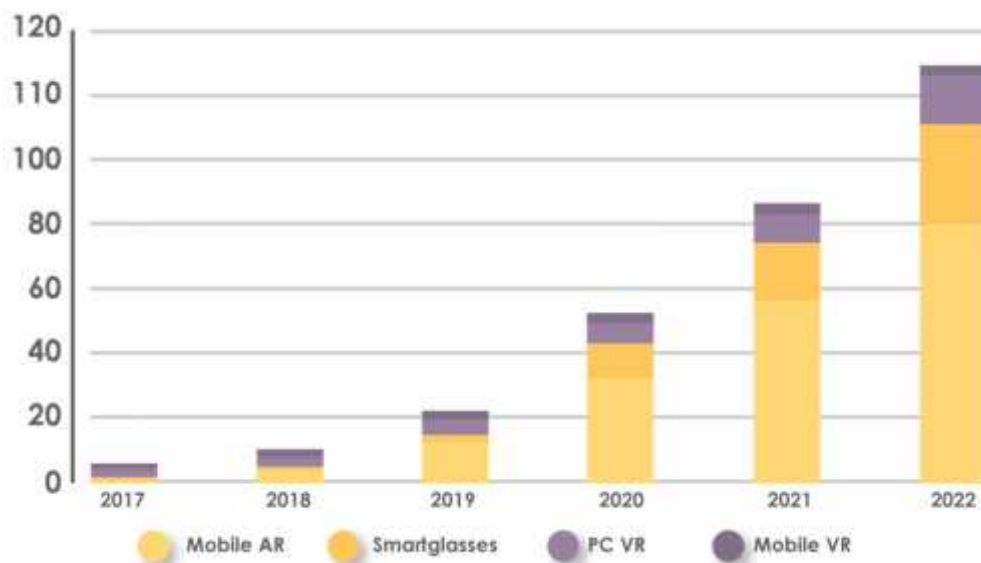


Figure 8 – VR / AR Technologies Market

Source: Digi-Capital [8]

According to the schedule, it is clear that the total cost of the AR / VR market will be about 115 billion US dollars. But the distribution is uneven. This suggests that the AR market will be much more in demand already in 2020 and its cost will be 90 billion US dollars. Nevertheless, although the market potential of VR reduced by the emergence of mobile AR as a competing platform last year, saying, «VR is dead» would be a big mistake.

The mobile / standalone VR (Samsung Gear VR, Google Daydream View, Oculus Go) are more focused on mobile VR, and can significantly increase their profits in the long run.

Console / PC VR (HTC Vive, Oculus Rift, Microsoft Windows Mixed Reality, Sony Playstation VR) can grow significantly by 2020 due to lower costs and better performance. Perhaps, by 2025 VR will receive a mark of 500 million sold devices.

Smartglasses (Magic Leap, Microsoft HoloLens, ODG, Meta, Vuzix) remain the long-term future of AR / VR. If in 2020, Apple will start using a smartphone with a snap of smart glasses, as predicted by Digi-Capital, the market could grow from several hundred thousand corporate users last year to several tens of millions of mass consumers by 2022.

Just as experts from Digi Capital report, in the 4th quarter of 2017, investments in the VR / AR sector reached a record level of 1.5 billion at that time. As a total investment for the year is 3 billion in 28 categories of use of VR / AR. Most likely, this is due to the company Magic Leap. They opened the veil of secrecy over their new product and taking less than one-fifth of all the money collected in 2017.

The market of VR / AR technologies in Ukraine is limited only by the gaming segment. Unfortunately, there are not enough venture funds that could finance the domestic startups. In Ukraine, there are no manufacturers of virtual reality glasses themselves. Basically it is imported products - HTC Vive. But there are developers. The main companies are:

– New Cave Media – the company develops software for VR and 360 ° video clips. The people are more engaged in missionary work. They form the market and customers, tk. demand is still too small;

– WeAR Studio – the company specializes in both virtual and augmented realities. Develop different solutions and software for VR glasses. In addition, they develop turnkey projects in the field of real estate and design.

Table 1 lists the main players on the market of VR-devices and prices for the most popular products in Ukraine. Prices given in UAH.

Table 1 – Comparative table of prices for popular VR-devices in the best stores of digital devices in Ukraine

Sales Mode	On-line			On-line/Off-line		
	Rozetka	OLX	Hotline	Allo	Citrus	Comfy
Samsung Gear VR	3678	1799	2611	3999	3999	2999
Oculus Rift	–	6900	19671	–	18499	–
HTC Vive	31999	20500	29740	33999	–	33999
Sony PlayStation VR	12999	9700	12477	12999	12999	12999

The data taken from the official websites of the stores. For a more complete picture, the stores divided into 2 large categories: on-line shops (online stores) and off-line sales, where you can come and see the goods themselves. It is immediately evident that in online stores the device is much cheaper. But the Ukrainian consumer is not always ready to order on the Internet, especially when there is a big discrepancy in the price. You can also observe the absence of Oculus Rift in almost all stores. But in Allo and Comfy, you can pre-order. Stores say that in the near future VR-devices will appear on the shelves. In the market of developers of AR-applications, the main companies are:

– Simo AR – the company develops an AR-browser. With the help of the application, the user directs the smartphone's camera to the image or object and receives 3D animation, video, HTML content or other information on the screen;

– Livecoloring – the company has developed an excellent application for children. Printing a free coloring, the child paints it, and then, using the phone screen, animates the picture;

– Augmented pixels – one of the largest manufacturers of AR applications in the world. Now, they specialize in controlling robots and drones with AR.

In 2017, Sensorama Lab and UNIT.City gathered all the information on Ukrainian projects related to VR / AR development and on its basis created the catalog and infographics of the Ukrainian startups (fig. 9).

The market for VR / AR devices is currently in the initial stages. There are game rooms, but for the full implementation of this little. In order for the consumer to be ready for new technologies, he needs to be acquainted with them. Also actively use VR / AR not only in gaming areas, but also in training. Excellent these technologies can and use in teaching medicine, construction and mechanical engineering. This will maximize the training of students, without using improvised means.

The problem of marketing research of this work is to study the potential target audience, namely: consumers, their behavioral models, gender differences.

To qualitatively form a problem, it is necessary to disassemble it by its components. The first problem of marketing research, which will answer the question of whether to enter the market with VR / AR goods, is «the definition of demand for a new product and the study of the target audience». This issue divided into 2 components: the demand for the goods and the target audience.



Figure 9 – The market of Ukrainian start-ups in the sphere of VR / AR

Source: ain.ua [9]

The following hypotheses put forward for these components:

1. Men and women are positive about VR / AR technologies;
2. Men and women relate to travel with VR / AR-technology positively;
3. Men and women assess the risks of using technology at an average level;

4. Men and women believe that Ukraine is ready for mass use of VR / AR technologies;
5. There are segments of consumers with different knowledge and attitudes towards technology;
6. There are latent factors explaining the behavior of consumers.

The choice of methodology for conducting a study depends on the outcome to obtain. In this case, the formation and study of the target audience. Three types of research are suitable for this purpose:

1. Survey;
2. Focus group;
3. In-depth interview.

The comparative characteristics of the three methods given in Table 2.

Table 2 – Comparative table of research methods

	Interrogation	Focus Group	Interviews
Sampling	The sample is calculated by the formula based on the Laplace parameter, the variance and the level of allowable error.	5-10 people who are interested in the product.	1 person who is a highly qualified specialist in the research and related fields.
Cost	Different. Depends on the purpose and conduct of the.	From 100-400 \$ per person.	Depends on the price list of the interviewee. As a rule, 300 - 500 \$.
Technology of conducting	Different. Polls conducted in places where the target audience is crowded. Can be conducted in on-line and off-line modes.	Conducted in a comfortable environment in the mode of group work and live communication.	One-on-one interview on pre-prepared questions.
Live communication	As a rule, there is no.	The moderator, before whom the task is to understand the attitude of the focus group to the product under study.	The interviewer is a qualified expert in the study of this product. It is also obliged to have psychological skills and be flexible.
Processing of results	The results are processed using mathematical models and software. Models chosen depending on the purpose of the study.	After the end of the study, audio and video materials analyzed and a report compiled.	After the end of the study, audio and video materials analyzed and a report compiled.

Given the lower resource use and the popularity of using mathematical models to study the target audience, a descriptive research method chosen – a survey with closed questions in on-line format. Its main advantages are:

- Low cost;
- There is no influence on the part of the interviewer;
- Use of illustrations;
- Mathematical justification of the results;
- Disadvantages;
- Presence of «self-sampling»;
- The possible influence of the environment on the interviewee;
- The sample may not have the desire to interview.

The definition of the sample determined by the formula:

$$n = \frac{t^2 \times 0.25}{\Delta^2}$$

Where:

Laplace parameter $t = 2$ ($\alpha = 0.9546$);

Dispersion $\sigma^2 = 0,25$;

The error level is $\alpha = 5\%$.

Hence, the sample size is 400 people. Because the questionnaire is online and distributed through targeted advertising on social networks, then the sample will include people selected according to the following parameters: men and women aged 14, interested in modern technologies and innovations, students in schools, universities and people working in the areas of IT technology, training, media and recent visitors to electronics stores.

Because under the conditions of a student it is impossible to interview 400 people, it decided to reduce the sample to 40 respondents.

After determining the methods of marketing research and calculation of the sample, a survey questionnaire is developed. The questionnaire developed on the Google Form resource. All questions are consistent with the aims and objectives of the study. In the questionnaire, there are only closed questions with a five-point scale of answers. The questionnaire consists of 11 questions and is anonymous.

Next to your attention is the form:

«The attitude of the consumer to VR / AR-technologies».

Kind time of the day! ONPU Global Marketing conducts an independent research to determine your attitude to VR / AR technologies. VR is a technology for creating virtual reality. AR – technology to create augmented reality. Your answers will give us a more complete picture of the existence of VR / AR technologies in Ukraine. Thank you in advance for your time!

1. Indicate your gender:

- Male;
- Female.

2. Indicate your age:

- 14-17 years;
- 18-25 years;
- 26-35 years;
- 35+.

3. What is your attitude to VR / AR technologies?

- It's terrible;
- Bad;
- Does not matter;
- Good;
- Well.

4. How do you feel about learning with VR / AR technology?

- It's terrible;
- Bad;
- Does not matter;
- Good;
- Well.

5. How do you feel about traveling with VR / AR technology?

- Strongly bad;
- Bad;
- Does not matter;

- Good;
 - Well.
6. Do you think that the future is behind the technologies of virtual and augmented realities?
- Strongly bad. They will destroy the perceptions of the real world;
 - No. This is only a way to distract people from real problems;
 - I do not care;
 - Yes, but you have to be careful with them;
 - Yes, it's a great way to get to know the world and spend time with pleasure.
7. Assess the physical risks of using VR / AR technology on a 5-point scale, where 1- risk is very small, 5 – the risk is very high?
- 5;
 - 4;
 - 3;
 - 2;
 - 1.
8. In your opinion, is Ukraine ready for massive use of VR / AR technologies?
- Strongly unprepared and vryatli will be;
 - No, I'm not ready. Probably, in due course it will be ready;
 - I do not care;
 - Yes, the year-the second and VR / AR technologies will be used by every second Ukrainian;
- Was ready yesterday.
9. How much are you willing to pay for devices that use VR / AR technology? (VR helmets, AR-glasses and more)?
- 100 – 500 \$;
 - 500 – \$ 1,000;
 - 1000 – 1500 \$;
 - 1500 – 2000 \$;
 - 2000 \$ +.

Analysis of demography (fig. 10).

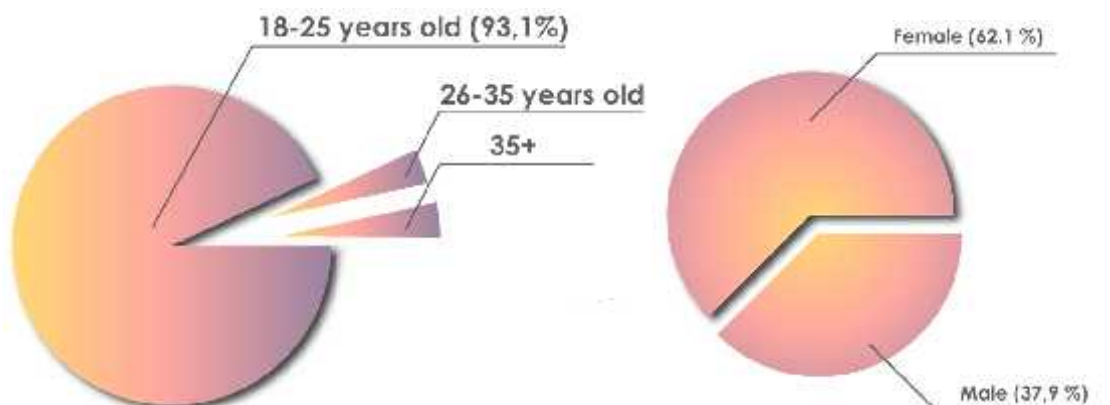


Figure 10 – Number of respondents based on «gender» and «age»

Based on the data, we can conclude that 62.1% of the respondents were girls. And the age of the respondents varies from 18 to 25 years. This is 93.1% of respondents.

Analysis of the t-test.

This criterion used for paired samples. This makes it possible to understand the ratio of the two variables to all respondents. For the analysis, two criteria chosen: attitudes toward travel and learning. The t-test rejects the hypothesis if the value of the variance criterion is less than 0.05 (Tabl 3).

Table 3 – Criterion for independent samples

		A criterion for the equality of variances of Levin	
		F	Sign.
Travel	Equality of variances is assumed	13,177	,001
Training	Equality of variances is assumed	,196	,661
Risk	Equality of variances is assumed	2,741	,106
Masses	Equality of variances is assumed	9,733	,003

Hypothesis 1 – Men and women relate to learning with VR / AR technology positively. The hypothesis confirmed, since the criterion for the equality of variances is 0.001 and this is less than 0.05.

Hypothesis 2 – Men and women relate to travel with VR / AR technology positively. The hypothesis is rejected, since the criterion for the equality of variances is 0.661 and this is much more than 0.05. Similarly, based on group statistics, it can argued that men relate to travel indifferently, and girls are negative.

Hypothesis 3 – Men and women assess the risks of using technology at an average level. The hypothesis is rejected, since the criterion for the equality of variances is 0.106 and this is greater than 0.05. Similarly, based on group statistics, it argued that men are more optimistic about risk of using technology than girls.

Hypothesis 4 – Men and women believe that Ukraine is ready for mass use of VR / AR technologies. The hypothesis is confirmed, but in the opposite meaning: the criterion for the equality of variances is 0.003 and it is less than 0.05, and the respondents' answer fluctuates at level 2 – at the moment Ukraine is not ready to use VR / AR technologies.

In general, men and women relate to technology positively. But there are certain differences, namely:

1. There is a significant difference in their attitude to the use of technology in teaching. In women, the average score is higher;
2. There is a significant difference in their assessment of the mass use of technology in Ukraine. Here men are more optimistic, because their average score is higher.

Cluster analysis.

Cluster analysis used in the case of the formation of clusters – target audiences, with which it will be necessary to work further. Clustering occurs according to Ward's method.

Because of processing clusters, all respondents divided into three clusters: the first included 20 elements, the second – 15, and the third – 5 (Tabl. 4).

Table 4 – Number of observations in each cluster

	1	20,000
Cluster	2	15,000
	3	5,000
Valid		40,000
Missing values		,000

It is worth to note that the clusters divided based on usage and cost of using VR/AR technologies. So it is worth considering that for all three clusters are important this fact as training. The final cluster centers shown in table 5.

Table 5 – Cluster end centers

	Cluster		
	1	2	3
General Relation	3,90	3,67	4,20
Travel	3,15	2,07	4,40
Future	4,15	1,67	4,00
Risk	2,85	3,00	3,20
Mass	2,40	2,07	3,40
Cost	1,00	1,53	4,20
Training	3,90	3,53	4,80

1 cluster has a high overall ratio to VR / AR technologies, respondents agree that the future is behind the technologies of virtual and augmented realities and positively assess training with the help of new technologies. At the same time, they are not seriously concerned about the risks, they believe that Ukraine is not ready for mass use of VR / AR technologies and respondents are not at all ready to pay big money for their use. Such a group of clusters conditionally called «neutral».

2 cluster is characterized by an indifferent attitude to factors of general attitude, risk and learning. At the same time, they negatively relate to travel with the help of new technologies and do not believe that the future is on VR / AR technologies. Such group of clusters conditionally called «skeptics».

3 cluster has high rates of general attitude to VR / AR technologies, to travel, they believe that the future is for VR / AR technologies, they are willing to pay a fairly large amount of money, and the indicator of using VR / AR technology in higher education level. Such group of clusters conditionally called «foremost».

Based on the cluster analysis, we can conclude that hypothesis number 5 confirmed.

Factor analysis.

Factor analysis allows us to determine which hidden variables hidden behind the answers of respondents.

First of all, we determine the correlation by the correlation matrix in Table 6.

In this case, the correlation takes place on the following issues:

- The general attitude does not correlate with anyone;
- Attitude toward learning correlates with risk in the opposite direction;
- Relation to travel, attitude to VR / AR technologies in the future and release of such technologies to the masses in Ukraine.

Table 6 – Correlation matrix

	General Relation	Learning	Travel	Future	Risk	Mass	
Correlation	General Relation	1,000	,415	,214	,216	-,380	,245
	Learning	,415	1,000	,339	,419	-,354	,179
	Travel	,214	,339	1,000	,578	,049	,578
	Future	,216	,419	,578	1,000	-,114	,321
	Risk	-,380	-,354	,049	-,114	1,000	-,296
	Mass	,245	,179	,578	,321	-,296	1,000

Next, the test carried out as the adequacy and criterion of Bartlett. If the Kaiser-Meier-Olkin selective adequacy measure is greater than 0.5 and the Bartlett value is less than 0.05, the factor analysis is applicable. An analysis of the adequacy measure presented in Table 7.

Table 7 – A measure of adequacy and the Bartlett test

The measure of selective adequacy of Kaiser-Meier-Olkin.	,583
Approx. chi-square	61,969
The Bartlett sphericity criterion	15
st.sv.	,000
Value.	

Based on the table, we can conclude that the factor analysis is applicable, since the measure of selective adequacy of the CME is 0.583, and the significance of the Bartlett sphericity criterion is 0.

According to Table 8. we can infer about the number of factors that are calculated.

Table 8 – Full Explained Variance

Component	Initial eigenvalues			Sums of squares of loads of extraction			Sums of squares of loads of rotation		
	Total	% Dispersions	Cumulative %	Total	% Dispersions	Cumulative %	Total	% Dispersions	Cumulative %
1	2,563	42,710	42,710	2,563	42,710	42,710	2,099	34,986	34,986
2	1,285	21,420	64,130	1,285	21,420	64,130	1,749	29,144	64,130
3	,852	14,207	78,337						
4	,617	10,290	88,627						
5	,453	7,543	96,171						
6	,230	3,829	100,000						

According to the table, we see that there are 2 factors. The factors analyzed in Table 9.

Based on the table, the following two factors identified:

– Factor 1 – lack of interest in VR / AR technologies, the risk of using new technologies is very high, and the latter can only use for training. Such factor called «conservatism».

– Factor 2 – positive attitude to travel, believe that the future for VR / AR technologies and Ukraine is already ready for mass use of new technologies. Such a factor called «liberalism».

Table 9 – The matrix of rotated components

	Component	
	1	2
General Relation	,194	,743
Learning	,390	,633
Travel	,926	-,009
Future	,775	,158
Risk	,060	-,845
Mass	,670	,239

Since discovered two factors affect the choice of the buyer. Hence, we conclude that hypothesis No. 6 confirmed.

Conclusions from this research and prospects for further developments in this area. This research allowed to draw conclusion: in Odessa there is a target audience, which is ready to purchase goods. Also, with a competent advertising campaign, you can significantly increase the demand. Table 10 shows the characteristics of the identified target audiences.

Table 10 – Characteristics of identified target audiences

	Advocates	Neutrals	Skeptics
Age	Z		Y
Gender	Male, Feminine		
Behavioral model	They are inclined to acquire technological novelties, pay high prices for them and talk about products. If the product is of poor quality, the audience may be the enemy of the brand	Wait until the product becomes known, they read reviews of Peredovikov, analyze various versions of the product and only then purchase. They are not ready to pay thousands of dollars for a technological novelty. They are for practical application and are ready to wait until the price of the product falls to the minimum mark. To reduce the time of reflection of the foremost, you can create an agiotage around the novelty.	People whom until the last think about buying a product. They consider it useless and unnecessary, advertising the product causes emotions that are more negative. In this case, educational events and conferences help, where the product can be used «here and now», which will increase the credit of trust
Relation to VR / AR products	Very good attitude to VR / AR technologies, to travel, they believe that the future is for VR / AR technologies, and the indicator of using VR / AR technology in the field of training at the highest level.	Good attitude to VR / AR technologies, respondents agree that the future is behind the technologies of virtual and augmented realities and positively assess training with the help of new technologies. At the same time, they are not seriously concerned about the risks, they believe that Ukraine is not ready for mass use of VR / AR technologies	Indifferent, sometimes negative, attitude to factors of general attitude, risk and learning. At the same time, they negatively relate to travel with the help of new technologies and do not believe that the future is on VR / AR technologies.

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