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PERVASIVE TECHNOLOGIES ON B2C DIGITAL PLATFORMS

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Abstract

Digitalization has reorganized markets and created new intermediators – digital platforms. However, these processes spark controversy. On the one hand, digital platform innovation leads to increase in economic efficiency. Breakthrough technologies have been proposed new format of communication with consumer, reshaped production and delivery processes. On the other hand, it might pose threat to consumers` autonomy. In this article, we aim to detect some technologies, being crucial for digitalization on consumer market. After we undertake a review of the governmental programs and investigations into global technological trends, we combine it with the qualitative analysis of Web of Science data and Google Trends Ratings. As a result, we draw a matrix of pervasive technologies corresponding with selected consumer markets. They include such solutions as Big Data & Business Analytics, Cloud computing, AI, VR/AR, Robotics, IoT, Wireless, Blockchain. We analyze possible potential ways of applying the identified promising technological solutions into consumer practices.

Keywords: Digital platform, pervasive technologies, consumer market.

1. Introduction

Digitalization is a generally accepted trend in modern world. There is a considerable amount of literature on information economics, digital technologies, their benefits and costs, published by World Bank, OECD (OECD, 2017; World Bank, 2016).

More recent evidence (Bughin, Manyika, & Catlin, 2019) highlights that there is a gap in digital intensity between global digital platforms and traditional enterprises. Being a relatively new phenomenon, digital platforms have dramatically changed existing business models and inspired hyperscaled businesses with level of performance far higher than in other economic sectors.

Several studies provide the conceptual framework for the study of digital platforms. Gawer (2014) proposes multi-dimensional approach combined economic and technological view on digital platforms.

De Reuver, Sørensen, and Basole (2018) reveal the complexity of digital platforms due to their distributed nature and close connection with institutions, market, and technologies.

An increasing number of researchers clearly state that the boundaries between the industries are often blurred in the digital era (Yablonsky, 2018). New technologies has transformed industrial structures, economic value creation, and reshaped the competition strategies. Kenney, Rouvinen, Seppälä, and Zysman (2019) argues that information economics has changed the expenses structure. High fixed costs of building digital platforms combined with the low marginal costs of adding new participants give firms opportunities to set price below the production cost to attract clients. Companies try to make platform more valuable for participants, thereby increasing switching costs. It enables them to benefit from market power and, finally, raise price.

The article is organized as follows: in previous section, we describe data used for selection of the relevant technologies; then we discuss the influence of selected technologies on consumer market**.**

2. Problem Statement

Modern technologies allow firms to collect and use information about almost all aspects of human behavior and give them opportunities to manipulate consumers` choice. Digital platforms tend to know about consumers` needs and wants more than people themselves. In our investigation, we try to identify some breakthrough technologies, influenced the development of consumer market.

3. Research Questions

In the article, we concentrate on the following questions:

(1) What kind of breakthrough technologies are the most relevant to consumer market?

(2) Are they equally important for all parts of consumer market?

4. Purpose of the Study

The purpose of this article is aim to detect modern technologies, being crucial for digitalization on consumer market.

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5.   Research Methods

We started from MIT annual reports on breakthrough technologies. Based on these data, we have grouped given inventions into broad categories.

Table 01. Breakthrough technologies, according to MIT Technology Review 2016-2019 and Web of Science

	Number of references	Articles in WoS		
		Total	For the last 5 years	
			Total	%
Robotics	2	117335	46198	39,37
Artificial intelligence	4	42873	17835	41,60
Personalized medicine, genetic engineering	7	51492	21606	41,96
Medical engineering	3	14107	5531	39,21
Quantum technology	2	19809	8026	40,52
Energetics	5	N/A	N/A	N/A
i.a. solar energetics	2	152719	69349	45,41
generation IV fission and fusion reactors	1	192	55	28,65
Internet of things	2	34280	29439	85,88
Self-driving vehicle	2	25307	12169	48,09
Software	6	N/A	N/A	N/A
Others	7	N/A	N/A	N/A
Source: Web of Science				

In the next step, we addressed to the Web of Science Core Collection to confirm the growing interest in these categories (table 01). It is remarkable that nearly 40% of articles in these areas were published within the last 5 years.

To consolidate the breakthrough technologies we used some investigations into foresight combined with governmental programs related to Industry 4.0 (HSE, 2017; Kostin, 2018).

It is not exaggeration to say that the breakthrough technologies spread over all areas of human activity. Thus, the experts use a term `pervasive technologies to underline their significant impact on the economy as well as on the way humans manage their lives.

According to an ambitious program for digitalization of Russian economy, pervasive technologies include, amongst others, big data, neuro-technologies, artificial intelligence (AI), blockchain hardware and software, quantum computing technology, robotics and sensor-based technologies, wireless communications, virtual and augmented reality (VR/AR) (HSE, 2017).
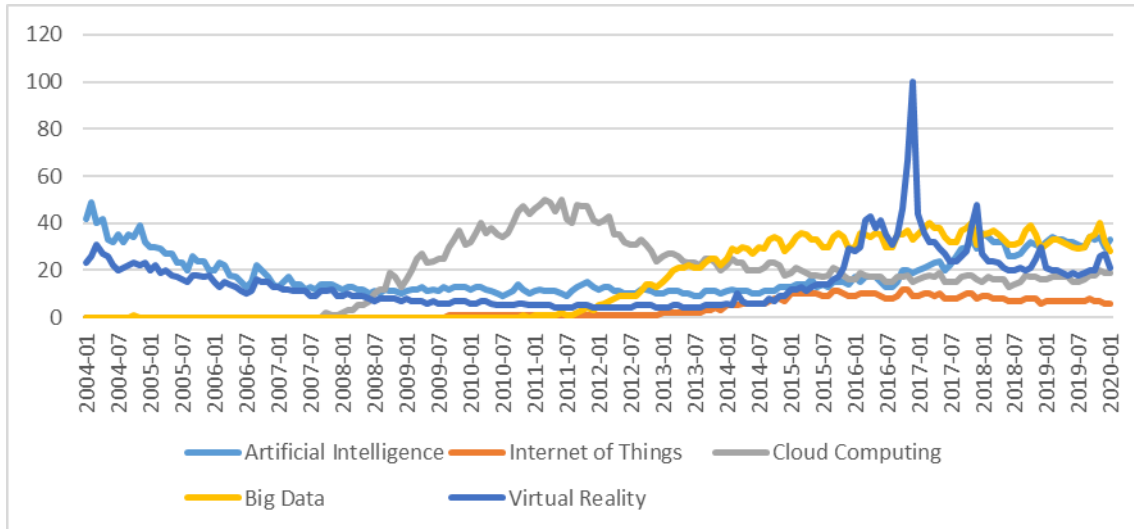
Figure 01. Pervasive technologies in Google Trends Rating

We also used Google Trends to trace the popularity of the selected technologies. Google Trends has recently became acclaimed to identify trends and preferences of internet users. It shows how often a given term is entered Google search engine to the total search volume. Unfortunately, its ability to compare search terms is limited by five, therefore, we focused on the technologies grown rapidly in the last few years and dominated in various markets (Figure 01).
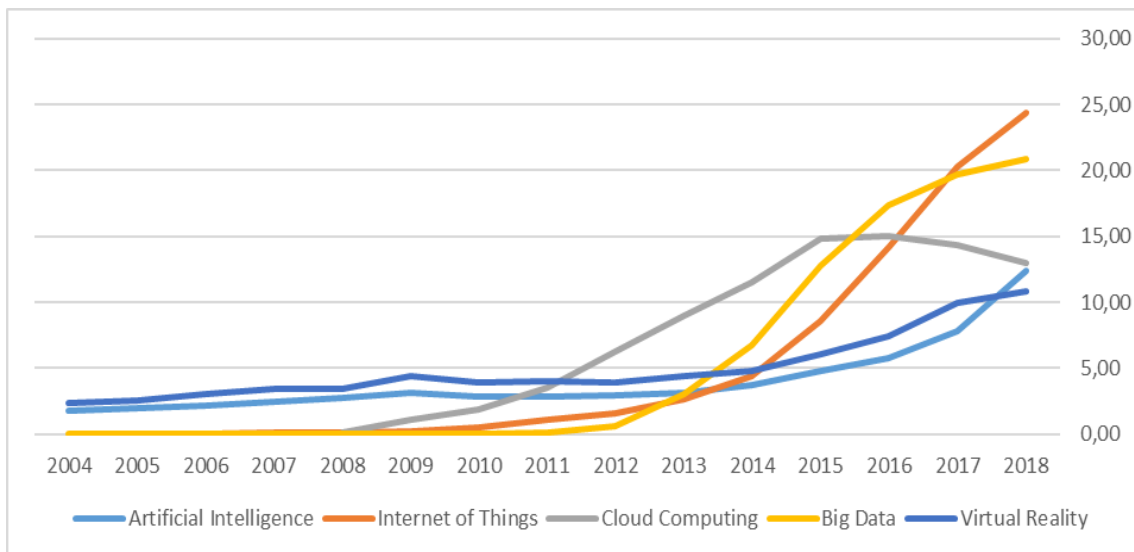

Figure 02. Publications in Web of Science Core Collection related to selected technologies (in % to the whole number of publications).

The most intriguing is that Google Trends enables to detect an incipient interest in potentially breakthrough technologies. Whereas AI and VR were in the public eye since 2004, completely new trends arose in the last decade. In 2009-2012, cloud computing was the absolute leader among the search terms. In 2013, it lost, however, the 1st place and ceded the leadership to big data. AR has left behind recently boomed VR and remains current leader in the list of popular queries.

Finally, we compare the results from Google Trends with the publication activities in selected fields. According to Web of Science Core Collection, the number of articles generally corresponds with the level of queries popularity (Figure 01, 02). Although, there is a gap between the peak of interest in certain topic and the highest number of articles, we can conclude that selected technologies are relevant to our investigation.

6. Findings

In our investigation, we concentrate on pervasive technologies for consumer markets. Being flexible, service industry undergo digital transformation at first. Therefore, we have chosen a range of services that are crucial for consumers, such as retail, finance, education, health care, and transport (see table 02). We also add construction and agriculture, because these industries meet the basic needs of the population.

Table 02. Pervasive technologies on consumer markets

	Transport and communication industry	Media, advertising	Finance	Retail	Tourism	Education	Health care	HR	Agriculture	Construction
Big Data & Business Analytics	+	+	+	+	+	+	+	+	+	+
Cloud computing	+	+	+	+	+	+	+	+	+	+
AI	+	+	+	+	+	+	+	+	+	+
VR/AR		+		+	+	+	+			+
Robotics	+	+	+	+	+	+	+	+	+	+
IoT	+		+			+	+		+	+
Wireless	+		+	+		+	+		+	+
Blockchain			+	+					+	

Further we consider these technologies in details.

1.Big Data

A few years ago, big data has made significant breakthrough in different fields, for instance, robotics, medicine, and astrophysics. Nowadays, big data & business analytics play a key role in business development. According to International Data Corporation (IDC), value of this market will reach $ 274.3 billion by 2022. Banking, discrete manufacturing, professional services, process manufacturing, and government have emerged as leaders in making investment in big data & business analytics solution. IDC expect that combined these industries will generate nearly half ($91.4 billion) worldwide revenue on this

market in 2019. The fastest growth shows securities and investment services (15.3% compound annual growth rate (CAGR)) and retail (15.2% CAGR) (IDC, 2019).

2.Cloud computing technologies.

Cloud computing makes it possible to manage rapidly growing data. It is vitally important to business, especially, to small and medium enterprises to achieve economy of scale due to sharing resources. Cloud computing allows access to modern and reliable solutions for antivirus, spam and fraud protection. The on-demand availability of high-capacity networks, low-cost computers and storage devices reduces IT infrastructures costs. The beneficial effect is estimated at 25-50 % (HSE, 2017).

3.Artificial Intelligence (AI).

AI is based on algorithms used for simulating of human intelligence. In recent years, significant breakthrough was reached in voice recognition and object identification. Using these technologies, AI enables to perform specific tasks in different areas. For example, AI can be implemented in banking to avoid fraudulent transactions or provide personalized recommendations to clients (Businessinsider, 2019). It can also accomplish tasks in staff recruitment or control smart devices at home. The survey of PwC shows that a small minority (8%) of Russians have smart assistants at home. Over half of them (53%) use it to do on-line shopping. Almost 40% of users task virtual assistants to hear music and manage smart home devices (PwC, 2019).

4.Virtual and augmented reality (VR/AR)

This sector is expected to boom during the next years. According to IDC, worldwide spending in VR/AR will increase from $16.8 billion in 2019 to $160 billion in 2023. VR/AR is gaining share in education, health care, tourism, and more due to its ability to facilitate communications, provide access to resources, and find solutions to complex problems (IDC, 2019). For instance, in retail it transforms customer experience. The customer will have an opportunity to test a good before purchasing (PwC, 2019).

5.Robotics

Robots can potentially overcome human cognitive and physical limitations. Wearables, powered exoskeleton, bionic prosthetic devices will improve quality of life, changing the way people live and work. Robots are expected to perform wide range of tasks from nursing care and harvesting to financial consulting.

6.Internet of things (IoT)

IoT encompasses computing devices, machines, and objects, connected to internet. This system makes it possible to gather and analyze information, facilitate different processes, and deploy resources. Nowadays, the number of connecting objects has left behind the population of the Earth.

Bringing networks together, IoT allows devices to communicate across different networking types and create connecting world. For instance, local authority in Spain and South Korea try to benefit from networking, using IoT to manage urban infrastructure (HSE, 2017).

7.Wireless communication.

IoT demands global telecommunication infrastructure for quick and cheap information transfer. Wireless includes a broad range of forms and procedures permitting communications without cables or other form of electrical conductors. The absence of physical connection results in flexibility, convenience,

and cost efficiency (HSE, 2017). For example, RFID tags enable to track flow of goods automatically; and NFC makes payment easier.

8.Blockchain

The blockchain is conventionally defined as a digital distributive ledger, which stores information or data, existing across multiple participants in a peer-to-peer network (IDC, 2019). It implies that there is no central repository of the leger. Thus, each transaction can be verified by any participant. Due to its transparency and security, blockchain has gained in popularity in finance, healthcare, and government.

Our brief overview of the breakthrough technologies shows that some of them are falling outside the sphere of direct contact with consumers. For instance, cloud computing and big data are in demand by firms, whereas IoT influences the consumers` daily routine directly.

Therefore, we divided selected technologies into three groups. The first group include robotics, IoT, and VR/AR. These technologies could provide better living conditions for consumers. The second block (AI, blockchain) transforms business processes and influences the consumers` behavior indirectly. The third block contains big data & business analytics, cloud computing, and wireless communications. Including radically new ways of data collecting and processing, it forms a basis for the other groups.

Based on this conceptual framework, we plan to conduct a further research into threats caused by digitalization on consumer market in a form of an online brainstorming discussion.

7.   Conclusion

In conclusion, we should note that despite the potential for life standard growth, modern technologies can threaten the consumers` autonomy and their right to privacy. Nowadays, people resist digitalization in a mild form: reject from social networks or geo referencing. We expect that digital resistance will increase as far as more and more areas will be captured by digital transformation. Consequently, there is a need in procedures and mechanisms should be established to adapt innovation and make it a part of daily routine.

Our investigations into this area are still ongoing and we suggest two questions for further research: (1) What are the sources of digital resistance? (2) What are the tools to overcome the fears and neglect of modern technologies?

Acknowledgments

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