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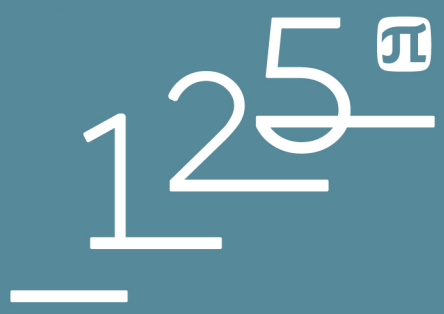

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SMART UNIVERSITY IN THE CONTEXT OF DIGITAL TRANSFORMATION

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Abstract. The goal of this article was to figure out the specifics of the Smart University concept in the context of rapid digital transformation. The components of Smart University concept were discovered and studied and various technologies required for a smart university to function as a whole were listed. Based on that the IT architeture for a Smart University was proposed. The proposed university model architecture allows for a monitoring of the campus environment, controls the campus environment, and provides an intelligent service opportunity with the frameworks, as well as placed devices. A rough outline for a project implementation timeline was formed and caclulated, and an analysis of benefits and disadvantages of implementing such a project was carried out.

Keywords: Smart University, Digital Transformation, Business architecture, Smart University Model Architecture, Smart University IT Architecture

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SMART-УНИВЕРСИТЕТЫ В КОНТЕКСТЕ ЦИФРОВОЙ ТРАНСФОРМАЦИИ

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Аннотация. Целью данной статьи было выяснить специфику концепции «Smart университет» в условиях стремительной цифровой трансформации. Были выявлены и изучены составляющие концепции «умного университета», перечислены различные технологии, необходимые для функционирования умного университета в целом. На основе этого была предложена ИТ-архитектура «умного университета». Предлагаемая архитектура модели университета позволяет осуществлять мониторинг среды кампуса, контролировать среду кампуса и предоставляет возможность интеллектуального обслуживания с помощью фреймворков, а также размещенных устройств. Был сформирован и рассчитан примерный график реализации проекта, проведен анализ преимуществ и недостатков реализации подобного проекта.

Ключевые слова: умный университет, цифровая трансформация, бизнес-архитектура, модельная архитектура умного университета, ИТ-архитектура умного университета

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Introduction

It was thought that the rapid technology changes experienced today would open a new era in the field of learning. The covid-19 pandemic, which started in Wuhan, China in 2020 and affected the whole world, triggered this change. Research shows that this change is taken 5-10 years earlier . For these reasons, many universities in the world have changed their vision. Even universities using the most traditional learning model had to switch to smart university mode in this process. The learning arena is gradually influenced by technological advances such as e-learning, IoT etc. which are rapidly and absolutely changing the way educators provide instruction and teach students. A Smart University is a university that uses technological innovation within its organization to accomplish its mission (Mbombo and Cavus, 2021).

In order to achieve its strategic goals, the Smart University uses innovation technology within its organization (e.g. IoT, smart devices, etc.) is a university that uses. Technological developments and innovations in the world, especially data systems and innovations in computer technology make the formation of a smart university even easier (Banica et al., 2014; Yathongchai et al., 2013). Anyone can work with e-learning, from teachers to administrators and students. With e-learning, they can reach their goals. And if we compare it with traditional education, it significantly reduces the cost of labor, electricity, etc. lowers costs.

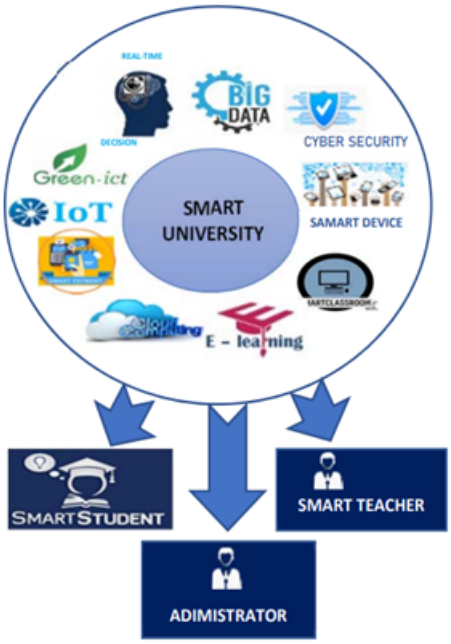

Fig. 1. Payment execution process "AS IS"

Figure 1 shows the representation of the Smart University and the new technologies that distinguish it from a traditional university. As can be seen, the distinction is in e-learning, Internet of Things (IoT), Cloud computing, big data, Green-ICT etc. It lies in the integration of new technologies, including A university with the integration of these new technologies is considered a Smart University. An intelligent learning framework uses IoT as part of new technology it can partner with to improve the quality of its services by providing a personalized learning environment (Stavropoulos et al., 2010). Intelligent institutions not only use IoT to customize learning, but also data size, processing speed, etc. It uses it together with big data to manage the challenges associated with it (Sun and Shen, 2016).

E-learning contains a lot of data. They require a large amount of Audio, Video, Diagrams, Contents, 3D models and information formats. E-learning has revolutionized education. While most universities advocate traditional education, most have now decided to switch to coeducation.

Materials and Methods

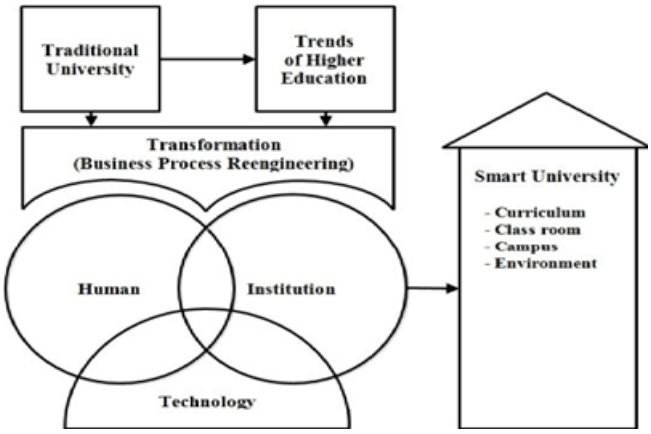

Fig. 2. Smart University Components

It is possible to consider the smart university in 3 points. Technology, Institute, Human.

1. Technology - infrastructure, data and software.
2. Human - Administration, Students, Teachers, Staff, Service providers, and security.
3. Institute – Class Rooms, Faculty, Learning Environment.

In addition, seven features can be added to the smart university.

1. Smart Transportation
    - In-Campus Navigation
    - Fleet Tracking
    - Smart Parking
    - Intelligent Signage
2. Security & Safety
    - Face Recognition
    - Smart Security Systems
    - Tracking
3. Analytic Data Center
    - Data Storage
    - Research
4. Smart Facilities Service
    - Smart Administration (Registration & Tracking)
    - Smart Facility Management Systems
5. Smart Classrooms
    - Virtual Reality
    - Remote Digital Learning
    - Cloud Sharing Platforms
6. Energy Management
    - Tracking with Devices
    - Smart Street Lights
    - Smart Energy Management System
7. Smart E-Student Card
    - E-Wallet (Students can use this card like a credit card)
    - Records all Personal Data
    - Access to Facilities (Dormitory, Gym, Labs, Classes)

With smart transportation, the number plate of the cars in the university will be read with smart cameras and will increase security. Vehicle density in the campus can be measured from maps. With smart parking and smart signage, students will be told which parking spaces are empty and this will reduce traffic (Kumar, 2018; Recalde et al., 2017). Security and safety will follow students with cameras and recognize their faces with face recognition technology. This will prevent unauthorized access to the school. With smart security systems and Tracking technology, the movements of vehicles and people in the school can be tracked.

The analytical data center can also collect university information, information from smart devices, student & teacher information in a data stroge. The Research Center, on the other hand, can provide services to teachers and students. Smart facilities provide smart assistance in student enrollment and will reduce the congestion that can occur in this process (Daniel, 2015; Shorfuzzaman et al., 2019). And it applies smart management in school facilites (gym, classes, labs) and prevents unnecessary water and electricity loss and saves money. This reduces costs.

Smart classrooms offer students the opportunity to learn in virtual reality. It provides an important help, especially in departments with technical courses. Distance education also helps students. Provides an interactive upload area where students and teachers can share (Paul et al., 2016; Tian and Zhao,

2014). Energy management, monitors the buildings, lights and energy systems on the campus of the university together with smart energy tracking devices. And it prevents wasted energy and saves energy. Significantly reduces costs. Smart student cards make students' lives on campus significantly easier. Students can load money on their smart student cards and use them as credit cards. In addition, students can access the school's facilites by having these cards read to the school's smart doors. In addition, all the information of the students is included in these smart cards.

Adding all these features to smart universities autonomously will make important contributions to smart universities. There will be a significant decrease in costs, security will increase, efficiency from university will increase.

Business Plan

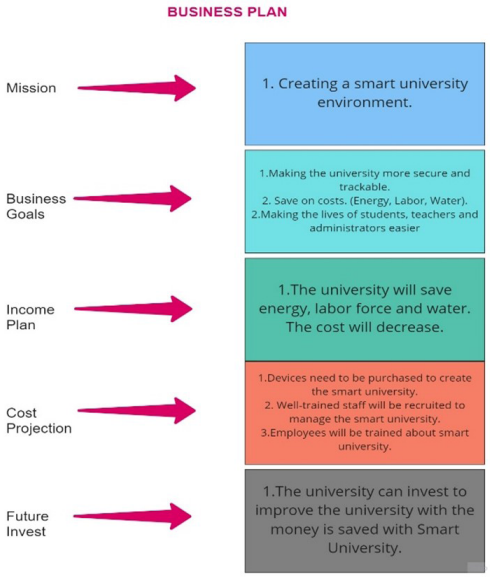

Fig. 3. Business Plan

Results

Smart University IT Architecture

The table below shows the technology required for a smart university to function as a whole. The monitoring layer is important because smart devices, iot devices form the basis of smart university. Without these devices, it becomes impossible to talk about smart university.The monitoring layer collects information with related devices. And it transfers this information to the Business Layer.

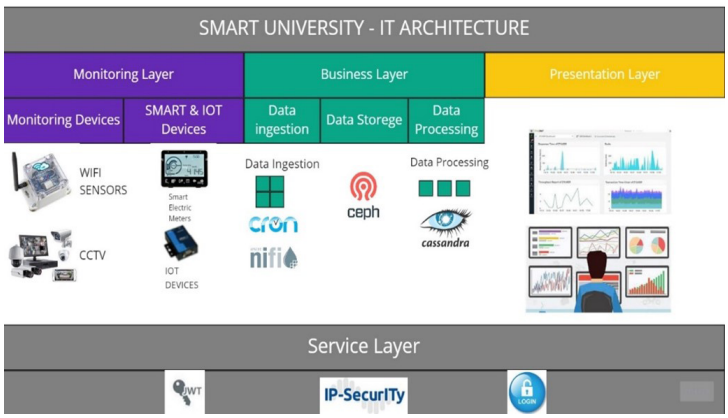

Fig. 4. Smart University – IT Architecture

Business layer can think of it as a storage system. Smart messages from smart devices are stored here (Alonso Secades and Arranz Garc a, 2016; Nazarenko and Khronusova, 2017). The business layer processes and stores data from devices. And after processing, it serves the Presentation Layer. Finally, the presentation layer includes the necessary components for delivering services and information to end users. One of the most important parts is the presentation section. After the data and messages from smart devices are stored in the busines layer and transferred to the presentation section, the data is displayed here for interpretation. The services layer includes the global and global components of the service delivery platform, such as registration, login, authentication, connectors, and scripting, and includes security provisioning components (Berman, 2013; Koutitas and Demestichas, 2010; Ozdamli and Cavus, 2021).

Smart University Model Architecture

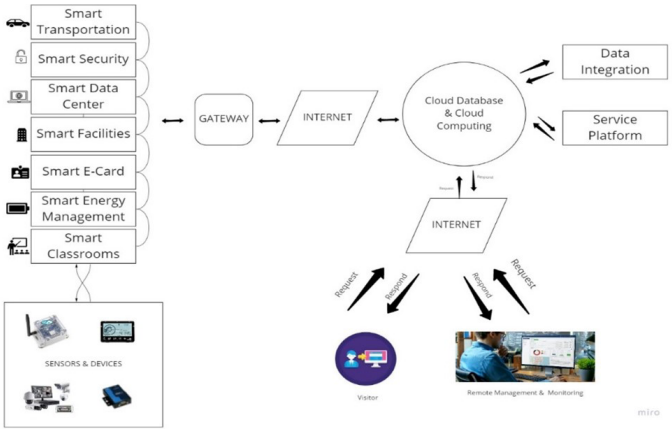

Fig. 5. Smart University Model Architecture

The university model architecture monitors the campus environment, controls the campus environment, and provides an intelligent service opportunity with the frameworks, placed devices, which are the seven features of the smart university. These 7 elements that are mentioned in the Smart University Framework and are important for a smart university. The smart campus system includes hardware and software devices. And cloud database is responsible for storage (Bai and Li, 2020; Karim, 2020). The data integration platform integrates storage data and middleware data to provide comprehensive information, service platforms serve to provide an intelligent application service to the end user.

Discussion

Planning

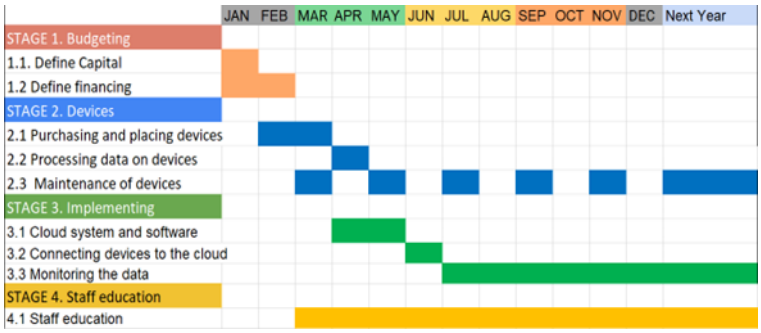

Fig. 6. Planning Process

Planning is a necessary step to achieve a desired goal. And this business requires assignment. Planning is considered as 1 year and the next year as each month. The planning divided into 4 parts. Stage 1 – Budgeting, Stage 2 – Devices, Stage 3 – Implementing, Stage 4- Staff Education.

Stage 1 – Budgeting

Define Capital - Determination of capital for investments to be made, equipment to be purchased and other expenses. It will take a month. January.

Define Financing - Determination of financing for investments to be made, equipment to be purchased and other expenses and after smart university is implemented, a feasibility study should be done to predict the profit or loss situation of the university. It will take 2 month. January and February.

Stage 2 – Devices

Purchasing and Placing Devices - The process of purchasing the relevant devices and placing the devices in their places. It will take 2 month February and March.

Processing Data On Devices - Process of processing and understanding raw data from devices. It will take a month. April.

Maintenance Of Devices - The devices should be maintanence every two months, including the first month after the devices are purchased. This is a necessary process, any technical glitch in the devices can affect the whole process. It will take 6 month in a year. March, May, July, September, November, January.

Stage 3 – Implementing

Cloud System and Softwares - Installation of cloud systems and software. It will take 2 month. April and May.

Connecting Devices to Cloud System - The process of connecting devices to cloud systems and software after deploying devices. June.

Monitoring The Data - Data monitoring process. Every month.

Stage 4 – Staff Education

Staff Education - Smart university is constantly updated as it is a new technology. Therefore, regular training should be continued every month in order to teach our staff this new technology and keep them knowledgeable in this new technology. Staff must be well trained. Because any wrong behavior of the staff can negatively affect the whole process.

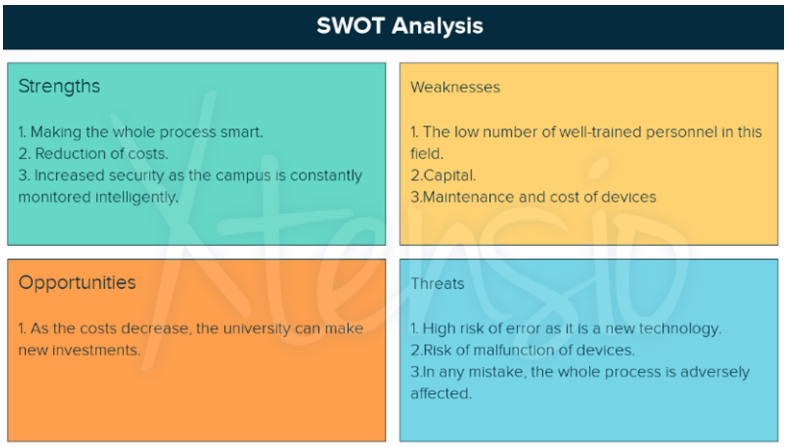

Fig. 7. SWOT Analysis

Conclusion

Technological developments lead to new information in the world. Using this new knowledge of

technological developments, companies can intelligently expand and strengthen their operations. These great technological developments are increasing the importance of the tools used. Iot devices and similar devices are an important actor in reading these technological data. Another area where digital technologies should be used is the field of education. Education is the most important starting stone of human life. Countries that formed this starting stone with solid and strong foundations are among the most developed countries of today. A solid foundation of education will enable students to be more successful in the future. For this reason, universities should not be deprived of digitality. With the smart university, students will adapt to the university environment faster. Better efficiency can be obtained from motivated students after better adapting to the university environment. Motivated students will succeed, and successful students mean a better university reputation.

With smart technologies, universities can save fuel, energy, workforce, etc. will provide significant savings in resources. Universities can increase the quality of education, teachers and equipment by investing in more important points with the money they save. And finally, the pandemic in the world showed us that. Normal universities were closed during the pandemic and became inactive. But smart universities continued to operate. This showed the whole world how important smart universities are.

REFERENCES

Alonso Secades V., Arranz Garcia O. 2016. Big Data & eLearning: A Binomial to the Future of the Knowledge Society. IJIMAI 3, 29–33.

Bai D., Li H. 2020. A Summary of Domestic and Foreign Education Big Data Literature. Advances in Intelligent Systems and Computing. Springer, Singapore, 308–312. DOI: https://doi.org/10.1007/978-981-15-2568-1_42

Banica L., Paun V., Stefan C. 2014. Big Data leverages Cloud Computing opportunities. International Journal of Computers & Technology 13, 5253–5263.

Berman J.J. 2013. Principles of Big Data: Preparing, Sharing, and Analyzing Complex Information, 1st edition. ed. Morgan Kaufmann, Amsterdam.

Daniel B. 2015. Big Data and analytics in higher education: Opportunities and challenges. British Journal of Educational Technology 46, 904–920. DOI: https://doi.org/10.1111/bjet.12230

Karim S. 2020. Big data: challenges and opportunities in Australia. Global Journal of Business, Economics and Management: Current Issues 10, 1–20.

Koutitas G., Demestichas P. 2010. Challenges for Energy Efficiency in Local and Regional Data Centers. Journal of Green Engineering 1, 1–32.

Kumar K. 2018. Advancing learning through smart learning analytics: a review of case studies. Asian Association of Open Universities Journal 13. DOI: https://doi.org/10.1108/AAOUJ-12-2017-0039

Mbombo A.B., Cavus N. 2021. Smart University: A University In the Technological Age. TEM Journal 10, 13–17.

Nazarenko M.A., Khronusova T.V. 2017. Big data in modern higher education. Benefits and criticism. DOI: https://doi.org/10.1109/ITMQIS.2017.8085914

Ozdamli F., Cavus N. 2021. Knowledge sharing technologies in higher education: Preferences of CIS students in Cyprus. Education and Information Technologies 26, 1833–1846. DOI: https://doi.org/10.1007/s10639-020-10336-8

Paul A., Chilamkurti N., Daniel A., Rho S. 2016. Intelligent Vehicular Networks and Communications: Fundamentals, Architectures and Solutions, 1st edition. ed. Elsevier, Amsterdam Boston Heidelberg.

Recalde A., Endara, I Quimis M., Romero C. 2017. Operational framework proposal for ESPOL university 2.0 smart campus implementation. 2017 IEEE Second Ecuador Technical Chapters Meeting (ETCM), 1–6. DOI: https://doi.org/10.1109/ETCM.2017.8247523

Shorfuzzaman M., Hossain M.S., Nazir A., Muhammad G., Alamri A. 2019. Harnessing the power of big data analytics in the cloud to support learning analytics in mobile learning environment. Computers in Human Behavior 92, 578–588. DOI: https://doi.org/10.1016/j.chb.2018.07.002

Stavropoulos T., Tsioliaridou A., Koutitas G., Vraka D., Vlahavas I. 2010. System Architecture for a Smart University Building. Proceedings of Artificial Neural Networks - ICANN 2010, 477–482.

DOI: https://doi.org/10.1007/978-3-642-15825-4_64

Sun G., Shen J. 2016. Towards organizing smart collaboration and enhancing teamwork performance: a GA-supported system oriented to mobile learning through cloud-based online course. International Journal of Machine Learning and Cybernetics 7, 391–409.

Tian W.D., Zhao Y.D. 2014. Optimized Cloud Resource Management and Scheduling: Theories and Practices, 1st edition. ed. Morgan Kaufmann, Waltham, MA.

Udupi P.K., Malali P., Noronha H. 2016. Big data integration for transition from e-learning to smart learning framework, Proceedings of the International Conference on Big Data and Smart City (ICBDSC), 1–4. DOI: https://doi.org/10.1109/ICBDSC.2016.7460379

Yathongchai W., Angskun T., Angskun J. 2013. SQL Learning Object Ontology for an Intelligent tutoring system. International Journal of e-Education, e-Business, e-Management and e-Learning 3, 168.

Zhu Z. 2016. A research framework of smart education. Smart Learning Environments 3, 4-9. DOI: https://doi.org/10.1186/s40561-016-0026-2

СПИСОК ИСТОЧНИКОВ

Alonso Secades V., Arranz Garcia O. 2016. Big Data & eLearning: A Binomial to the Future of the Knowledge Society. IJIMAI 3, 29–33.

Bai D., Li H. 2020. A Summary of Domestic and Foreign Education Big Data Literature. Advances in Intelligent Systems and Computing. Springer, Singapore, 308–312. DOI: https://doi.org/10.1007/978-981-15-2568-1_42

Banica L., Paun V., Stefan C. 2014. Big Data leverages Cloud Computing opportunities. International Journal of Computers & Technology 13, 5253–5263.

Berman J.J. 2013. Principles of Big Data: Preparing, Sharing, and Analyzing Complex Information, 1st edition. ed. Morgan Kaufmann, Amsterdam.

Daniel B. 2015. Big Data and analytics in higher education: Opportunities and challenges. British Journal of Educational Technology 46, 904–920. DOI: https://doi.org/10.1111/bjet.12230

Karim S. 2020. Big data: challenges and opportunities in Australia. Global Journal of Business, Economics and Management: Current Issues 10, 1–20.

Koutitas G., Demestichas P. 2010. Challenges for Energy Efficiency in Local and Regional Data Centers. Journal of Green Engineering 1, 1–32.

Kumar K. 2018. Advancing learning through smart learning analytics: a review of case studies. Asian Association of Open Universities Journal 13. DOI: https://doi.org/10.1108/AAOUJ-12-2017-0039

Mbombo A.B., Cavus N. 2021. Smart University: A University In the Technological Age. TEM Journal 10, 13–17.

Nazarenko M.A., Khronusova T.V. 2017. Big data in modern higher education. Benefits and criticism. DOI: https://doi.org/10.1109/ITMQIS.2017.8085914

Ozdamli F., Cavus N. 2021. Knowledge sharing technologies in higher education: Preferences of CIS students in Cyprus. Education and Information Technologies 26, 1833–1846. DOI: https://doi.org/10.1007/s10639-020-10336-8

Paul A., Chilamkurti N., Daniel A., Rho S. 2016. Intelligent Vehicular Networks and Communications: Fundamentals, Architectures and Solutions, 1st edition. ed. Elsevier, Amsterdam Boston Heidelberg.

Recalde A., Endara, I Quimis M., Romero C. 2017. Operational framework proposal for ESPOL university 2.0 smart campus implementation. 2017 IEEE Second Ecuador Technical Chapters Meeting (ETCM), 1–6. DOI: https://doi.org/10.1109/ETCM.2017.8247523

Shorfuzzaman M., Hossain M.S., Nazir A., Muhammad G., Alamri A. 2019. Harnessing the power of big data analytics in the cloud to support learning analytics in mobile learning environment. Computers in Human Behavior 92, 578–588. DOI: https://doi.org/10.1016/j.chb.2018.07.002

Stavropoulos T., Tsioliaridou A., Koutitas G., Vraka D., Vlahavas I. 2010. System Architecture for a Smart University Building. Proceedings of Artificial Neural Networks - ICANN 2010, 477–482. DOI: https://doi.org/10.1007/978-3-642-15825-4_64

Sun G., Shen J. 2016. Towards organizing smart collaboration and enhancing teamwork performance: a GA-supported system oriented to mobile learning through cloud-based online course. Inter-

national Journal of Machine Learning and Cybernetics 7, 391–409.

Tian W.D., Zhao Y.D. 2014. Optimized Cloud Resource Management and Scheduling: Theories and Practices, 1st edition. ed. Morgan Kaufmann, Waltham, MA.

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Zhu Z. 2016. A research framework of smart education. Smart Learning Environments 3, 4-9. DOI: https://doi.org/10.1186/s40561-016-0026-2

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RISKS OF INVESTING IN THE RESTAURANT BUSINESS: STRUCTURAL DIFFICULTIES EXACERBATED BY THE HEALTH CRISIS

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Abstract. In recent years, the pandemic and related restrictions have hit catering establishments hard. The market did not have time to adapt to the new realities, because in 2022 the company faced new and unforeseen problems related to sanctions. Supply chains are collapsing, suppliers are raising prices, and some of them stop working in the Russian market, there are problems with equipment. The purpose of the study is to assess the risk of investing in the restaurant business in modern economic conditions. In the course of the study, the assessment of the sphere of public catering enterprises until 2021 was carried out, the dynamics of opening and closing restaurants in St. Petersburg was shown, the dynamics of the turnover index and producer prices were analyzed. As a result of the study, the potential risks of investing in the field of public catering are considered and opportunities for investment in the current realities are identified. Despite the attractive image for investment, the catering market remains very difficult, especially considering its tendency to competition. In addition, the study revealed a number of key problems specific to this sector that a potential investor will have to deal with.

Keywords: catering, restaurant business, investment risk, investment, investor, risk assessment

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РИСКИ ИНВЕСТИРОВАНИЯ В РЕСТОРАННЫЙ БИЗНЕС: СТРУКТУРНЫЕ ТРУДНОСТИ, УСУГУБЛЕННЫЕ КРИЗИСОМ В ОБЛАСТИ ЗДРАВООХРАНЕНИЯ

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Аннотация. В последние годы пандемия и связанные с ней ограничения сильно ударили по предприятиям общественного питания. У рынка не было времени адаптироваться к новым реалиям, поскольку в 2022 года компания столкнулась с новыми и непредвиденными проблемами, связанными с санкциями. Цепочки поставок рушатся, поставщики повышают цены, а некоторые из них прекращают свою работу на российском рынке, возникают проблемы с оборудованием. Целью исследования является оценка риска инвестирования в ресторанный бизнес в современных экономических условиях. В процессе исследования проведена оценка сферы предприятий общественного питания до 2021 года, показана динамика открытия и закрытия ресторанов в СПб, проведен анализ динамики индекса товарооборота и цен производителей. В результате исследования рассмотрены потенциальные риски инвестирования в сферу общественного питания и выявлены возможности для инвестирования в текущих реалиях. Несмотря на привлекательный образ для инвестирования, рынок общественного питания остается очень сложным, особенно учитываю его склонность к конкуренции. Помимо этого, в результате исследования выявлен ряд ключевых проблем, характерных для данного сектора, с которым придётся иметь дело потенциальному инвестору.

Ключевые слова: общественное питание, ресторанный бизнес, инвестиционный риск, инвестиции, инвестор, оценка риска

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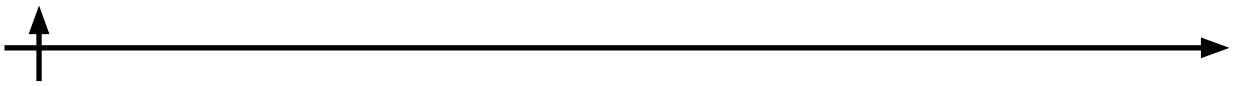
Introduction

In the period from 2010 to 2020, there was a significant growth in the field of public catering. Indeed, from 2010 to 2020, GDP grew by an average of 1.5% per year. These rates are much higher than the average annual growth rate of the entire economy (0.4%). All growth in this sector was observed in the subsector of catering and catering establishments, where an average annual growth of 2.3% was observed over the same period, while accommodation services remained stable. Two trends contributed to the growth of the sector. Firstly, the constant growth of the population and wages stimulated local demand for restaurants and drinking establishments.

The influx of immigrants to the region, especially in the last three years, has led to population growth reaching recent highs. Secondly, the decline in the value of the ruble on the international market since 2014 has made trips to the region relatively less expensive for tourists. Employment in the field of accommodation and food in St. Petersburg has grown by an average of 0.8% per year over the past decade. The greatest growth occurred in the period from 2019 to 2020, when employment in the sector reached a record high of 80,800 people (Shorikov and Butsenko, 2019).

Employment growth in the sector lagged behind GDP as employers tried to fill vacancies. After



healthcare and social assistance, the largest number of vacancies in the region is in the field of accommodation and catering (in the third quarter of 2020, slightly less than 4,200 vacancies were registered). The accommodation and catering services sector, measured as a percentage of total employment in the sector, has the highest vacancy rate among all sectors in the region, with the number of vacancies accounting for 4.8% of the total number of employees. A recent survey of tour operators showed that the positions of chef, cleaner, cleaner and check-in desk are the most difficult to fill. Although many new restaurants have opened in the area to meet the growing demand, some have closed permanently or temporarily due to staff problems.

Before the arrival of covid, 2019 was a positive year for the catering market:

– Petersburgers spent +1.7% on eating out.

– In places of public catering, attendance is +0.8%.

– Things were going very well in the sector, and he was promised a good tomorrow, but this was without taking into account the arrival of Covid.

In 2021, the figures have changed a lot, and the attitude of St. Petersburg residents to food, too. The covid-19 epidemic has led to the following results for the industry:

1. The turnover of the restaurant in 2020 amounted to 35.6 billion rubles, which is 38% less than in 2019.

2. Restaurant attendance dropped by 35%.

3. The first quarantine in 2020 led to the closure of catering establishments. Attendance dropped by 71% in April and May 2020.

4. In the period from June to October 2020, the outbound catering market fell by 28%.

According to a study by Food Service Vision:

– in April 2020, the drop in turnover from catering was estimated at 2.4 billion rubles.

– at the beginning of the quarantine, the turnover of restaurants fell by 88%;

– there has also been a net decline in business reputation, investors and entrepreneurs no longer want to take risks in a dangerous sector.

The takeaway sale, in fact, minimized the losses of restaurateurs. Having doubled its market share in the catering sector, it amounted to 15% in 2020 and 30% in 2021. In this line, fast food managed to take advantage of the situation. He lost only a quarter of turnover and visits. This category of food products scored 7 points in terms of market share and accounted for 43% of the total number of visitors to outbound catering (36% in 2019). Delivery and drive increased by 25% in expenses and visits. According to RBC, fast food occupies two thirds of the market in the drive. They manage to survive this period with less hassle, because this method of restoring food is fully adapted to the covid: distancing, very little contact, no obligation to wear a mask, etc. (Shulepina, 2016). This new way of eating at home has also proven to be extremely positive for ghost kitchens. These are restaurants that do not have a covered reception and are designed for door-to-door sales. These structures are possible thanks to delivery companies such as Delivery club or Yandex.Food. They are also the big winners of the health crisis.

Today, hygiene is becoming an even higher priority for catering professionals. This applies to customers, as well as the kitchen and service staff. Training will now be essential in the field of safety and hygiene. Transparency will be required, it is necessary to reassure the client more and more and show that barrier gestures and other obligations are fully respected (Kushcheva, 2015). Food companies are also the winners of 2021. Bakeries, for example, have never seen a decline in their attendance. This proves that restaurants need to diversify their business in order to remain as sustainable as possible and adapt to changes (InvestInRussia, 2021; Moiseeva and Gordeeva, 2017; Tashmukhamedova and Matyakubov, 2019). Takeaway sales with packed lunches, the creation of a grocery store, "push and take", home cooking are all ways of thinking about survival in a sector that has been largely affected by the crisis of 2021 (Ilyina and Kapustina, 2015).

Eating out is growing: in the period from 2008 to 2018, household consumption in the catering sec-

tor increased by 5.7% and amounted to 4.9 billion. 36% of household spending on food goes outside the home; and this is also an important fact that confirms the trend of recent years to prefer food in a restaurant to food at home. In addition, preference is given to places offering unusual taste sensations that tickle the taste and senses, but at the same time attention to traditional dishes and local products is declared. In the field of public catering in 2020, about 40% of the turnover recorded in 2019, a record year for food purchases outside the home with a turnover of 86 billion rubles, was lost: 1,692 companies in this sector closed, its doors and 407 were launched, which is a record low.

2020 was also the year when 77% of premises operated in delivery mode, and 27% of entrepreneurs in this sector opened a dark kitchen designed only for delivery, or a virtual brand to cope with forced closure, and this opened the door to capillary technological innovations both in the ways of cooking and distributing food, and in her choice (Mironova, 2020). As for delivery, according to the report, 43% of restaurateurs said that they deliver directly, with their own fleet of visitors and ordering systems, 3% rely exclusively on external platforms, and 9% use both methods. The remaining 45% is collected by those who have not yet focused on delivery, and those who have decided not to use it. 10% of respondents said they would like to keep the delivery or dark kitchen even after opening.

In 2020, 2.9 million people visited St. Petersburg. Of these, 2.4 million are citizens of the Russian Federation, 0.5 million are foreign citizens. In comparison with 2019, the tourist flow has actually decreased by 70% (Kuryaeva and Mazaleva, 2018).

The diagram of the division of market segments is shown in Figure 1.

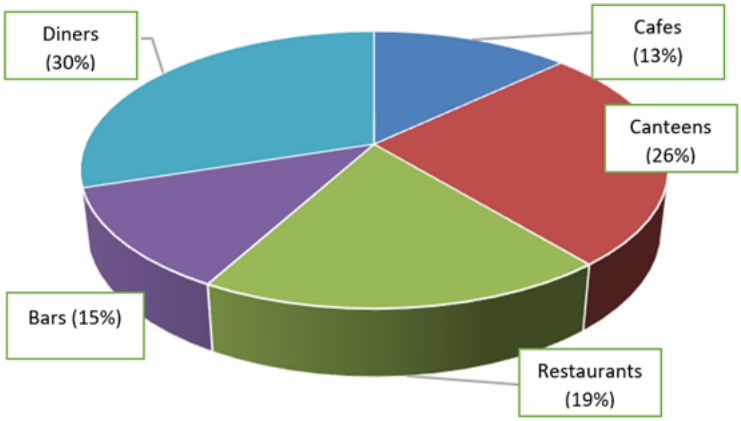


Fig. 1. Accommodation facilities by category in St. Petersburg

Most of the dishes of European cuisine are served in the restaurant market. The next one is Russian, with a share of 22%. Japanese cuisine occupies 8% of the total range of cuisines presented. The share of Italian cuisine is 5%. The remaining 26% falls on other types of cuisines: Spanish, Latin American, Chinese, Caucasian and others. For more information, see Figure 2.

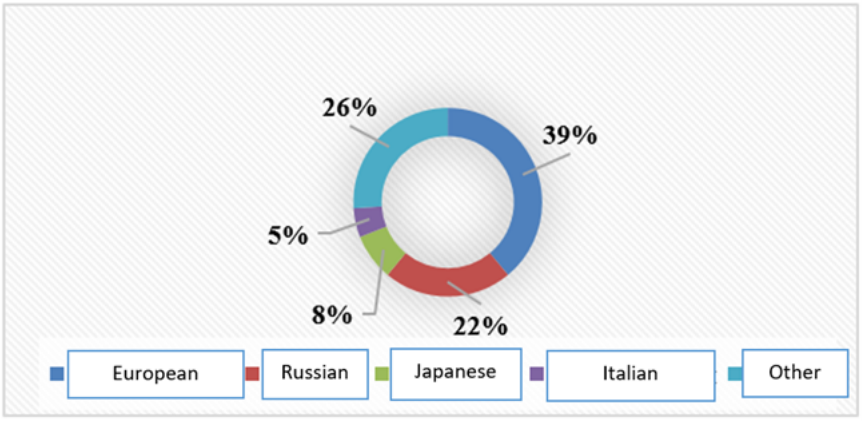


Fig. 2. Various types of kitchens located on the territory of St. Petersburg

During the pandemic, the occupancy rate of all restaurants, without exception, decreased several times compared to the values traditional for this time of year. Occupancy decreased to only 28%, but returned to normal in 2021 (Figure 4).

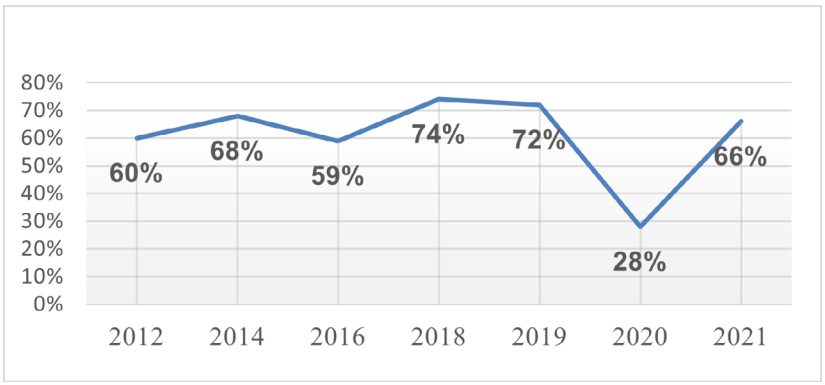


Fig. 3. Average load of LUXURY restaurants in St. Petersburg

Summarizing the latest reports, we can say that the market of outbound catering, affected by the Covid-19 crisis, showed losses of 35% of visits and 37% of expenses in the first eight months of the year compared to the previous year. Unsurprisingly, catering, which operated at only 15% of its normal capacity between March and May, is the most affected sector, with a drop of almost 45% in visits and costs. The decline is smaller for fast food restaurants: from January to August, losses amounted to about 25% (Kuryaeva and Mazaleva, 2018).

During the three months of containment, the fast food sector lost about two-thirds of visits and expenses compared to the same period in 2019: 64% fewer visits and 70% less expenses. Fast food was able to succeed, but no matter what, from March to May, it split the revenue in half. Three segments were able to adapt and limit their losses by focusing, in particular, on takeaways: supermarkets (with ready-to-eat meals/snacks), bakeries and pizzerias. Thanks to the delivery and removal, they were able to maintain activity, knowing that nomadic consumption traditionally accounts for 80% to 90% of their visits. As for the time of consumption, lunch was most affected by the restriction of freedom: the greatest loss of attendance (70%) was recorded from March to May and for eight months (40%).

During the first three months of restaurant openings (June, July and August 2020), the market recovered only 70% of its value compared to the summer of 2019. Showing a much faster recovery, fast food lost only 16% in price compared to the summer. 2019. The takeaway pizza and hamburger segments, in turn, have grown dramatically, demonstrating that fast takeaway options that appeal to a young audience

stimulate market dynamism. In the catering sector, the recovery is slower: the scheme restores only 70% of the previous year's cost (Kabir, 2013).

The meridian gap continues to suffer, in particular, due to the slowdown in the work of canteens and the practice of remote work adopted by many Russians. Lunch time, which seems to have lasted better during childbirth thanks to delivery (minus 64%), shows a resumption of attendance in June, July and August, while the number of visits decreased by 29% compared to 2019. As for profiles, the data clearly show the gap between generations: those who are "older than 55" returned to restaurants less (a 40% decrease in attendance compared to the summer of 2019) than the older generation. Young people (less than 20%) in visits. Women were also less likely than men to return to restaurants. The effect of Covid-19 is also felt in terms of consumer motivation and selection criteria.

Almost 75% of them say that compliance with sanitary standards and the implementation of an accurate protocol in a restaurant play an important role in choosing a point of sale. Finally, if Russians have less visited restaurants at the table in the summer of 2020, they have not given up entertainment, as evidenced by an 8% increase in the average ticket during dinners due to the consumption of additional products such as desserts, alcoholic aperitifs, etc. Both consumers and restaurateurs had to adapt very quickly and learn new habits during their incarceration. New practices and new proposals are shaping the HDR of tomorrow.

Although sales growth of 6% and expenses of 5% were recorded in this sector in 2021 compared to 2020, it is still "far" from the level of 2019. Commercial catering recovered last year despite being closed for five months due to the health crisis, but its turnover is still down by more than a third, according to a study conducted by RBC. 2021 ended with "a 6% increase in visits and 5% increase in expenses," but "it is still far from the results of 2019, as the market decreased by 30% of visits and 35% of expenses" compared to the period before the health crisis, the report says.

In 2019, the turnover of this sector amounted to 37 billion rubles. Commercial catering "out of the house" includes table service (cafes, bars, beer bars, cafeterias), fast food (fast food, takeaway/delivery, sandwich shops, bakeries, catering), meals in transport and on vacation (museums, train stations). Table food has been most affected by the health crisis: establishments had to close their premises to the public for five months last year, as in 2020. it fell again in 2021, with a turnover of -8% compared to 2020 and -53% compared to 2019, RBC clarifies. On the other hand, fast food has increased by 13% in terms of the number of visits and by 15% in terms of cost for the year, and is only 12% of the results of 2019 in terms of attendance and 11% in terms of cost (Kravets, 2008; Sultaneva, 2012). As for the digitization of orders, it "jumped": "orders made through an application, computer or terminal account for 470 million visits," "or 7% of the total number of visits against only 2% in 2019," RBC notes.

At the end of last year, large restaurant chains warned of a price increase of up to 15% in 2022. The main reasons for this reaction of market participants were the increase in prices for products and logistics services. In recent years, the pandemic and related restrictions have hit gastronomy hard. The market did not have time to adapt to the new realities, because at the end of February 2022, the company faced new and unforeseen problems related to sanctions. Supply chains are collapsing, suppliers are raising prices, and some of them stop working in the Russian market, there are problems with equipment. The situation has not yet affected the operation of restaurants. None of the market participants has significantly changed the way they work. Currently, the main processes are focused on the level of interaction between suppliers and restaurants.

With each such crisis, more and more ingredients that restaurants use are of ruble origin, which makes crisis processes smoother each time. Gastronomy, especially in Moscow and St. Petersburg, has already reached such heights that food in a catering establishment is sometimes cheaper than at home. The consumer will return to fast food, but visiting restaurants will not stop. We have already seen this during the 2014 crisis and at certain stages of the pandemic.

But the restaurant industry itself may change. Nevertheless, the most important sign of a successful

establishment is the ratio of price and quality of the restaurant. It is unknown how much more prices will rise. In order not to reduce the quality, we need to look for new forms of service. The most noticeable changes are expected by Russian consumers in the field of imported alcohol. Most of the most famous brands here belong to international companies. For example, the suspension of supplies by the French company Pernod Ricard means that importers cannot, as usual, import Chivas Regal, Jameson and Ballantine's whiskey, Olmec tequila, Absolut vodka and several dozen other brands to Russia. The Frenchman's main competitor, American Diageo, has stopped supplying Johnnie Walker whiskey, Captain Morgan rum, Baileys liqueur and Guinness beer (by the way, this is not a complete list of brands).

However, the restaurateurs themselves hope that the brands on the list will not disappear completely from the market. They are simply supported not by direct agreements, but by third countries that are not subject to sanctions. This will increase expenses, which have already doubled in the last two weeks due to the depreciation of the ruble. However, even if this does not happen, it does not mean that whiskey, tequila, rum and European wines will disappear from Russian establishments in principle. Neither the US nor the EU have imposed any restrictions on the supply of food and beverages to Russia, so even if well-known brands disappear from the Russian market for a while, they will be quickly replaced by less advertised brands that are still available in Russia, which are unknown, but not known.

The decline in the ruble exchange rate over the past eight years has already prompted many companies to pay attention to dyes. In addition to reducing the cost of entry, tinctures make it possible to get relatively unique drinks. The Russian Union of Shopping Centers and the Russian Union of Industrialists and Entrepreneurs are ready to negotiate with the Ministry of Trade of Russia on state support for Turkish companies in Russia. It mentions the provision of tariff preferences and loans, as well as grants for the opening of a shopping center to a new partner.

But in order to enter the market, you need to understand which kitchens will be the most profitable and in demand. As mentioned earlier, Georgian cuisine almost does not depend on foreign suppliers, so it has every chance to be considered one of the most profitable, along with Caucasian, Armenian and Turkish cuisine. At the same time, Mediterranean cuisine, which is so loved by Russian consumers, is extremely risky, due to possible supply disruptions and prices set by suppliers. In addition, it will be very ill-conceived to open Japanese-themed establishments, since the issue of seafood has not yet been established, and it may take some time for a decent import substitution of these products.

To increase the attractiveness of projects, land for the construction of new industries will be provided at the rate of 1 ruble. The crisis has led to the fact that Russians are forced to cut some items of expenditure from their budget, so in the restaurant business they have moved strongly towards fast food and trattorias. However, the overall dynamics of the sector is growing. The sector has been in a difficult situation for many years: the financial crisis of 2008 led to a sharp reduction in wage employment in the private sector and the closure of sites, which represented much fewer markets for catering enterprises. This also caused a decrease in purchasing power, which affected the size of the "average check" spent in restaurants.

Materials and Methods

Such methods as analysis, synthesis, generalization, methods of economic analysis (division of economic phenomena into factors or categories affecting the allocation of resources) were used for the statistical and economic methods, and computational and constructive method in terms of identifying patterns between economic phenomena and processes.

Results and Discussion

The traditional catering sector depends on the evolution of the purchasing power of households, which affects the level of attendance at establishments, as well as the average check. Competition between independent and restaurant chains, combined with the re-equipment of urban and tourist regions,

weakens traditional independent restaurateurs. Indeed, it is difficult for them to compete with the price positioning of non-branded networks. In addition, catering groups attract the interest of investment funds, which increases their investment ability. Moreover, this competition is intensified by the boom of fast food and "alternative" schemes (in particular, dark cuisine). The investment needs necessary to acquire and develop a business reputation are high and cause damage to companies with limited capital. In addition, due to the importance of location quality, rents are often very high.

Staff costs should be fully controlled. Wages are unattractive, and working conditions remain difficult (complexity, stressful pace, irregular working hours, etc.), restaurateurs have difficulty coping with high staff turnover and absenteeism. Qualified staff is hard to find. The use of non-standard jobs can jeopardize the quality of service (lack of motivation, problems with training newcomers, etc.). These recruitment difficulties are more acute for independent restaurateurs, as most structured groups now have an internal training center and are more attractive because of the mobility and development opportunities they offer to their employees. The development of online review sites (such as TripAdvisor) forces restaurants to monitor their electronic reputation (respond to reviews, encourage customers to leave reviews, use an agency).

Since 2010, the dynamics of the sector has slowed down sharply (+0.6% per year in volume versus +2.5% in the period from 2005 to 2010). The sector employs 110,000 full-time employees (+1% per year since 2010). These employees are mostly unskilled and often work part-time. Since 2010, the margin rate and economic profitability have deteriorated. The investment rate remains low (6% in 2021).In 2020, collective nutrition was severely affected by the Covid-19 health crisis during the first quarantine (-40% turnover in May compared to January). The opening of the school market was not enough to increase activity in general (-24% in September). Commercial chains are entering the catering market, which have ready-to-eat shops and their own cafes, more and more food industry enterprises, the development of the ready-to-eat segment and the intention to open their own ready-to-eat dishes. But the biggest problem is that large delivery aggregators are entering the market. Small restaurants that use the services are digging their own grave: they give away their already small profit and, in addition, all their valuable data about the guests. If aggregators choose dumping, they can lower prices so that all small and medium-sized restaurants abandon their business

In the period from 2010 to 2019, the dynamics of the catering sector slowed down sharply (+0.6% in volume per year compared to +2.5% in the period from 2005 to 2010), developing at a much slower pace than in the catering sector (+3.4%).) or market services (+3.0%) (fig. 1). In 2020, activities seriously disrupted by the Covid-19 pandemic recorded a sharp drop in production in the second quarter. Like the entire catering sector, catering companies have been hit hard by the health crisis associated with the Covid-19 pandemic. Their turnover fell sharply in the 2nd quarter of 2020 (-40% in May to January). However, all things considered, they suffered less from this first wave of the epidemic than their colleagues from commercial catering.

The resumption of activity after the first quarantine was not as noticeable in collective nutrition as in commercial catering, which fully benefited from summer holidays (-32% vs. -7% in August compared to January 2020). On the other hand, corporate restaurants were still influenced by the preservation of remote work, distancing rules limiting the number of guests present at the table at the same time, and fears of infection. Many employees present at the facility bring or order food delivery. The second quarantine had only a limited impact on the activities of collective nutrition, unlike commercial nutrition. For more information, see Table 1.

Table 1. Dynamics of the trade turnover index in 2021

Month	Collective meals are provided	Commercial catering	Complex nutrition	All outlets
January	100,0	100,0	100,0	100,0
February	99,6	99,9	98,9	97,5
March	81,7	43,7	48,7	84,5
April	64,3	29,6	27.2	74,0
May	60,0	25,9	29,6	75,3
June	59,5	69,6	68,1	83,9
July	56,9	86,8	82,5	87,7
August	67,9	93,1	89,4	90,7
September	75,5	89,4	87,3	92,4
October	80,3	77,7	76,0	92,5
November	77,6	36,5	40,0	88,0
December	72,3	51,2	41	90,1

At the same time, the dynamics of price growth from the manufacturer shows itself to be quite stable, and despite the fact that there is a tendency to rise in price, the growth rate is extremely low. The price dynamics are described in more detail in Table 2.

Table 2. Dynamics of producer prices since 2017

Period	Collective meals are provided	Commercial catering	Complex nutrition	All trading services
2017	100,0	100,0	100,0	100,0
2018	99,7	101,2	101,2	100,4
2019	100,6	102,5	102,5	101,0
2020	101,0	104.1	104,0	102,0
2021	101,7	105,6	105,4	103,2

The restaurant business accounts for more than four-fifths (84%) of sales. Almost three quarters (72%) of the sector's turnover is accounted for by collective catering: cooking (52%) and canteen management (20%).These revenues are supplemented by other types of catering: fast food (4.1% of sales), table food (3.9%), catering establishments, mainly providing meals and home delivery (1.9%), cafeterias (0.8%) and other types of restaurant activities (1.3%).

In 2021, 200,000 people worked in contract catering, that is, 110,000 people in full-time equivalent. There is widespread underemployment, especially in the field of cleaning (75% of jobs). This applies more to women than men: 42% of women work part-time compared to 15% of their colleagues. [21]. Contract catering is an unskilled activity compared to all market services: employees and workers predominate (42% and 32%, respectively, compared to 27% and 14%), and managers rarely (6% vs. 27%). Collective catering mainly recruits workers specializing in the food trade: kitchen assistants and apprentices (18.5% of the workforce), cooks and kitchen employees (13.5%), kitchen masters (6.6%), facility management (5.8%). For more information, see Table 3.

Table service occupies a prominent place, regardless of whether the staff is qualified (3.4%) or unskilled (9.3%), as well as cleaning (10.8%). Management is carried out by administrative and financial managers (2.0%), restaurant managers (1.7%) and sales managers (1.3%).

Table 3. Distribution of employees by socio-professional categories in 2021

Staff	Restaurants	Portable points	Trading
Entrepreneurs	0,2	17.2	9.4
Management team	6.3	4,5	27.1
Handyman	20.1	13.1	22.1
Staff	41,8	45,1	27,0
Laborer	31,6	20.1	14.3
Total	100,0	100,0	100,0

The distribution of jobs in the sector is relatively balanced: women occupy 55% of jobs, and men 45%. However, women are more likely to be engaged in unskilled work (70% of women compared to 25% of men). At this point, it is worth paying attention to the policy of social investment, the main obstacle of which is a simplified interpretation of social investments, which reduces them to a logic that is antonymous with respect to insurance. In addition, social investments are not a cheap option in the short term, although they can be profitable in the long term.

This financing problem arises, in particular, in the Russian Federation, which already have high social expenditures or are experiencing budgetary difficulties. There is a need to diversify social protection resources. For example, it is necessary to go beyond financing through contributions that burden the cost of labor. In addition, social investments are constrained by simplified budgetary supervision based on excessively uniform rules of the game, poorly suited to the very heterogeneous realities of the member countries, as well as the lack of foresight in budget arbitration. For example, under the influence of austerity policies in a number of countries, savings on education have been achieved, which is a blatant contradiction with the strategy of social investment, and as a result, many suffer from a lack of qualified personnel. Many of the expected benefits of social investment materialize only in the long term. The standard economic approach is to discount future costs and benefits.

There are several ways to do this, but they all proceed from the principle that future benefits (or costs) should be reduced by an amount (discount rate) reflecting the choice of expenses in the present, and not in the future (and vice versa for expenses of future periods). Investment is usually defined as spending on future benefits, not on consumption in the present. For private investors, the rate of return on investment should compensate for the costs of resource mobilization (Shevchenko, 2008; Voronova et al., 2019).

This is a program that is rather aimed at the potential protection of personnel, which contributes to increased motivation, as well as labor productivity, and accordingly increases the revenue indicator. Moreover, social investment is able to solve such problems as the hanged turnover of personnel, the outflow of qualified personnel, and as a result – the downgrading of the qualifications of the entire staff of the institution, which leads to financial losses. Also, the state encourages enterprises that have developed a system of social investment and personnel protection. Purchases of raw materials and other materials (mainly food) used for the production of dishes are structurally high in contract catering. In 2018, they accounted for 29% of the sector's turnover. For comparison, in commercial nutrition, this weight is only 20%, probably due to less use of already processed products. As a result, the industry's economy is very sensitive to food prices. Table 4 shows the proportion of intermediate consumption.

Table 4. Share of intermediate consumption in turnover in 2021

Representatives of public catering	Intermediate consumption	Product	Raw material	Purchase of services
Collective meals are provided	52,0	2.1	29.1	20,7
Commercial catering	55,0	9,8	20.1	25,0
Retail outlets	55,0	9,5	20,7	24,5

In 2021, intermediate consumption accounted for 52% of turnover in the catering sector under the contract, compared with 55% in commercial catering. Conversely, collective catering enterprises buy fewer finished products (2% of turnover compared to 10%) and fewer services, such as renting premises or equipment or using temporary workers (21% compared to 25%). However, they use subcontractors more: 8% of turnover compared to 1%. The margin rate of contract catering has halved over the period 2010-2018, from 13% in 2010 to 7% in 2021. This decline was especially noticeable in 2015 (-3 points), a year marked by general stagnation in activity, but also in 2020 (-2 points), in a much more favorable economic context. Indeed, the wage fund is growing (+3.2% per year) faster than the value added (+2.2%), due to the pressure exerted on the prices of collective food. [21]. In commercial catering, the margin indicator decreased by the same amount during this period (-6 points), but was higher (23% in 2010). The results are shown in Table 5.

Table 5. Margin value change rate starting from 2013

Period	Collective meals provided	Commercial catering	All trading services
2013	13.1	22,5	31.1
2014	12,9	21.1	29,9
2015	9,5	17,7	27,8
2016	8,7	17,9	28,2
2017	9.2	13,7	27,3
2018	8,8	18,5	27,7
2019	9,8	16,6	27,2
2020	9,5	18,4	28,3
2021	7.2	16,6	27,5

Despite a very sharp decline, the economic profit margin of catering players remains high (16%) compared to catering (12%) or commercial services (8%). This is due to the presence of a large amount of cash associated with the payment method (payment to suppliers in the long term, but immediate or rapid charging for food) and allowing you to create a negative need for working capital.

This is also the result of a lower level of fixed assets in the industry: the level of investment is relatively low (6% compared to 13% in the whole catering industry in 2021), as capital intensity (21% vs. 49%), even if the latter increased sharply and regularly during the period (12% in 2010 G.). Canteen management requires more investment than cooking since 2015: for example, companies specializing in the first type of activity show an investment level of 8% in 2018 compared to 4% for the rest. Supplier risk refers to any risk associated with the supplier's activities or organization that may affect the activities of the client company. For many years, supplier risk management has been a major challenge for the purchasing department. Today, 71% of procurement decision makers claim to be objective in this area.

The Standardization Association gives us its official definition: "Supplier risk is defined as the probability that the principal will see that his economic activity will deteriorate or even be interrupted due

to a failure in his relations with his suppliers and service providers or undesirable behavior on the part of one of them." There are many risks depending on the activities of the companies concerned or the nature of the purchases made. However, we can generalize these risks into four main categories. Strategic and financial risk concerns the financial condition of suppliers; this can take the form of economic dependence, bankruptcy, etc. It is important for the purchasing department to know how to manage the financial risks of its suppliers so as not to find themselves in such situations (Smirnov and Ilyina, 2017).

Contractual and legal risks include non-compliance with contracts and/or applicable legislation; example: legal interrogation, fraud, etc. Operational risk is associated with the goods/services offered; example: quality, breakdown or delay in production, delivery, etc. Reputational risk is associated with ethical, social and environmental aspects; example: scandal, disaster, etc. Remembering the collapse of Rana Plaza in 2013, which led to the deaths of more than 1,000 Bengalis working for well-known brands of ready-to-wear, and showed the difficult conditions in which they worked. To these four main families, of course, you can add others: cybersecurity, hygiene, economics, politics, customer satisfaction, etc.

In conclusion, it should be noted that in recent years, regulatory requirements on many issues have been strengthened by provisions on payment terms to suppliers. To this is added the pandemic that the market is experiencing, and its consequences: a major socio-economic crisis. In this context, it seems more important than ever to manage, anticipate and control supplier risks by conducting a complete and methodical mapping.

Conclusions

Thus, we can conclude that despite the attractive image for investment, the catering market remains very difficult, especially taking into account its tendency to competition. In addition, there are a number of key problems specific to this sector that a potential investor will have to deal with, namely:

1. Supplies of raw materials. The issue with suppliers has always been one of the most important in the restaurant industry. Enterprises have been building relationships with suppliers for years, trying new directions and alternating partners to find the most reliable and profitable supplies. To date, there is a question about the expediency of working with suppliers who supply food raw materials from abroad, since this type of supply can seriously increase in price, and is unacceptable for restaurateurs.

2. The ability to find an analogue of foreign products. There are certain types of products that are currently supplied only from abroad. This hits the Italian cuisine sector especially hard, where it is recommended to buy even flour from Italian producers. The seafood sector is also suffering, which has long built relationships with suppliers, and has not so often used the services of local producers. The danger here is whether it is possible to supply an analogue of food raw materials. So there is a possibility of replacing imported salmon with chum salmon and trout, which can be found in abundance among domestic producers.

3. Difficulty in finding qualified personnel. The restaurant business cannot boast of an excess of quality staff, and there are a number of reasons for this. This is a small salary, difficult working conditions, a large emotional load and a stereotype of youth for this area. The latter is especially important for the staff working in the hall. In addition, there is a more ethical problem when competing restaurants simply poach a qualified employee, instead of educating their own. This creates a huge problem, and restaurateurs have to hire people for certain positions, without certain skills and education. This leads to such problems as: a drop in the quality of service, a drop in the level of hygiene, an increased likelihood of personnel risks.

4. Reduction of margin value. This problem is one of the key ones, as it affects the restaurant's profit. The fall occurs for a combination of two reasons. The first is the increase in prices for products, which continues to grow, albeit at a small pace. The second is the lack of strong growth in household incomes, which puts restaurateurs in a situation where they pay more for raw materials, and they cannot change

prices because of the risk of customers leaving. This usually leads to a deterioration in the quality of the purchased products, as well as to a decrease in the portion volumes of dishes.

Sanctions have certainly changed the restaurant industry, and it's too early to make any predictions, but the prospects that have emerged are clearly visible. Due to the departure of a number of companies, the usual way of working in restaurants, which was developed during the pandemic, may change. The biggest changes are expected in the delivery sector, as fast food accounted for a large share of orders. Thus, it can be assumed that the consumer will return to the rhythm of visiting public catering places, as it was in the pre-covid period. Already today, many restaurants are narrowing their delivery activities by switching to working with the hall. This is a rather unexpected development, since during the pandemic period, many experts predicted that some restaurants would switch exclusively to delivery, following preferences. But in 2022, there is an unprecedented trend of new players entering the market. McDonald's alone had more than 800 establishments on the territory of the Russian Federation, and now, having left the market, there is a place for the same number of catering establishments that domestic restaurateurs want to use. Such a chance to capture market share has not been observed since the collapse of the USSR, so today St. Petersburg is the most attractive for investment in the food industry. Moreover, it should be done quickly, since major global players are already willing to take the places vacated after the departure of global food industry brands.

REFERENCES

Bera S. 2021. An application of operational analytics: For predicting sales revenue of restaurant, 209-235. DOI 10.1007/978-3-030-50641-4_13

Grosul V. 2017. Research of theoretical basis of business model quality management of restaurant business. Technology audit and production reserves, 19-23. DOI 10.15587/2312-8372.2017.94171

Ilyina O.V., Kapustina I.V. 2015. Substantiation of Methodological approaches to determining the system of food security in the region (on the example of St. Petersburg). Problems of modern economy, 211–214.

InvestInRussia. 2021. Restaurants managed by international operators in Russia.

Ivanova T.P. 2017. Innovation value as a basis for updating the business model of a restaurant business enterprise. Challenges and opportunities of scientific thought development. Collection of scientific articles: GPG Publishing Group, 53-58.

Kabir L.S. 2013. The investment model of the national economy: the main characteristics and impact of the tax regime. Stage: economic theory, analysis, practice, 4–24.

Koval L. 2021. New Opportunities for Restaurant Business Development Based on Computer Modeling of Consumer Preferences. DOI 10.25115/eea.v39i3.4714

Kravets E.V. 2008. Attractiveness and main directions of investment activity in the field of restaurant business. Bulletin of the Belgorod University of Consumer Cooperation, 229–234.

Kuryaeva G.Yu., Mazaleva D.A. 2018. Varieties of investment strategies. The best choice for an investor, in: Problems of Enterprise Development: Theory and Practice, 46–50.

Kushcheva N.B. 2015. Technologies and innovations for modernization of public catering enterprises, in: Actual Problems of Economics, Management and Education in the Field of Recreation and Tourism, 56–62.

Moiseeva A.E., Gordeeva E.V. 2017. Analysis of the profitability of investing in small and medium-sized businesses, in: Problems of Modern Economic Development, 107–112.

Santalova M. 2021. Features of Restaurant Business Management in a Competitive Environment. Socio-economic Systems: Paradigms for the Future. Springer International Publishing, 965-977. DOI 10.1007/978-3-030-56433-9_102

Shevchenko L.M. 2008. The history of attracting foreign investment in the Russian economy. Bulletin of the Tambov University. Series: Humanities, 44–49.

Shorikov A., Butsenko E. 2019. Risk analysis of investment design based on stochastic network modeling, in: Modeling and Analysis of Security and Risk in Complex Systems, 41–45.

Shtal T. 2021. Digitalization as a tool for ensuring innovative development of restaurant business.

Estudios de Economia Aplicada. DOI 10.25115/eea.v39i5.4898

Shulepina T.I. 2016. Foreign investment in Russia in the context of the globalization of the world economy, in: Modern Problems of Natural Resources Management and the Development of Socio-Economic Systems, 339–348.

Smirnov A.B., Ilyina O.V. 2017. The process of systematization of information for the analysis of business processes in the field of trade. Economics and entrepreneurship, 523–527.

Sultaneva N.L. 2012. A modern look at the state and trends in the development of the restaurant business. Modern problems of service and tourism, 97–99.

Tashmukhamedova K.S., Matyakubov A.D. 2019. Methodology for determining the effectiveness of investments. Bulletin of Science and Practice 5, 288–292.

Voronova O.V., Khareva V.A., Khnykina T.S. 2019. Current trends in the development of the services market of the Russian Federation in the context of digital transformation. International Scientific Journal, 19–25.

Wilke E. Restaurant attrition: a longitudinal analysis of restaurant failures, 17-20. DOI: 10.1108/09596119610111695

СПИСОК ИСТОЧНИКОВ

Bera S. 2021. An application of operational analytics: For predicting sales revenue of restaurant, 209-235. DOI 10.1007/978-3-030-50641-4_13

Grosul V. 2017. Research of theoretical basis of business model quality management of restaurant business. Technology audit and production reserves, 19-23. DOI 10.15587/2312-8372.2017.94171

Ильина О.В., Капустина И.В. 2015. Обоснование методических подходов к определению системы показателей продовольственной безопасности региона (на примере Санкт-Петербурга). Проблемы современной экономики, 211–214.

InvestInRussia. 2021. Рестораны под управлением международных операторов в России.

Ivanova T.P. 2017. Innovation value as a basis for updating the business model of a restaurant business enterprise. Challenges and opportunities of scientific thought development. Collection of scientific articles: GPG Publishing Group, 53-58.

Kabir L.S. 2013. The investment model of the national economy: the main characteristics and impact of the tax regime. Stage: economic theory, analysis, practice, 4–24.

Koval L. 2021. New Opportunities for Restaurant Business Development Based on Computer Modeling of Consumer Preferences. DOI 10.25115/eea.v39i3.4714

Кравец Е.В. 2008. Привлекательность и основные направления инвестиционной деятельности в сфере ресторанного бизнеса. Вестник Белгородского университета потребительской кооперации, 229–234.

Kuryaeva G.Yu., Mazaleva D.A. 2018. Varieties of investment strategies. The best choice for an investor, in: Problems of Enterprise Development: Theory and Practice, 46–50.

Кущева Н.Б. 2015. Технологии и инновации для модернизации предприятия общественного питания. Актуальные Проблемы Экономики, Управления и Образования в Сфере Рекреации и Туризма, 56–62.

Moiseeva A.E., Gordeeva E.V. 2017. Analysis of the profitability of investing in small and medium-sized businesses, in: Problems of Modern Economic Development, 107–112.

Santalova M. 2021. Features of Restaurant Business Management in a Competitive Environment. Socio-economic Systems: Paradigms for the Future. Springer International Publishing, 965-977. DOI 10.1007/978-3-030-56433-9_102

Шевченко Л.М. 2008. История привлечения иностранных инвестиций в экономику РФ. Вестник Тамбовского университета. Серия: Гуманитарные науки, 44–49.

Shorikov A., Butsenko E. 2019. Risk analysis of investment design based on stochastic network modeling, in: Modeling and Analysis of Security and Risk in Complex Systems, 41–45.

Shtal T. 2021. Digitalization as a tool for ensuring innovative development of restaurant business. Estudios de Economia Aplicada. DOI 10.25115/eea.v39i5.4898

Shulepina T.I. 2016. Foreign investment in Russia in the context of the globalization of the world economy, in: Modern Problems of Natural Resources Management and the Development of Socio-Economic Systems, 339–348.

Смирнов А.Б., Ильина О.В. 2017. Процесс систематизации информации для анализа бизнес-

процессов в сфере торговли. Экономика и предпринимательство, 523–527.

Султаева Н.Л. 2012. Современный взгляд на состояние и тенденции развития ресторанного бизнеса. Современные проблемы сервиса и туризма, 97–99.

Tashmukhamedova K.S., Matyakubov A.D. 2019. Methodology for determining the effectiveness of investments. Bulletin of Science and Practice 5, 288–292.

Воронова О.В., Харёва В.А., Хныкина Т.С. 2019. Современные тенденции развития рынка услуг Российской Федерации в условиях цифровой трансформации (на примере индустрии гостеприимства). Международный научный журнал, 19–25.

Wilke E. Restaurant attrition: a longitudinal analysis of restaurant failures, 17-20. DOI: 10.1108/09596119610111695

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APPLICATION OF RPA TECHNOLOGY IN MANAGEMENT AND DECISION-MAKING PROCESSES

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Abstract. This paper analyses RPA technology and its place in management and decision-making processes. The aim of this paper is to analyze various sources on the use and implementation of this technology in order to assess the current state of research in this field, as well as to build a dynamics model to further analyze the possibility of applying the technology in the future. This research analizes research papers in the various fields of RPA technology research. Both English-language and Russian-language sources were analyzed. Based on the analysis, conclusions were made about the current state of research, as well as conclusions about the position of RPA in the field of automation and the risks that are associated with the use of the technology in question. Further, the paper highlights indicators and builds models of the process in question before and after implementation, as well as models of the dynamics of the process using RPA technology. On the basis of the analysis conclusions are made about the practical impact of RPA on the process, as well as conclusions about the possibility of transformation and use of the model in the future. The result of the work is a grouped research on the topic of RPA with conclusions about the status of RPA, the features of this technology, the possibilities of its application, as well as process models and dynamics, based on which the conclusion about the possibility of using RPA in management processes and decision-making is made.

Keywords: RPA, process control, process automation, robots, control process, decision-making process, artificial intelligence, dynamics model

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ПРИМЕНЕНИЕ ТЕХНОЛОГИИ RPA В ПРОЦЕССАХ УПРАВЛЕНИЯ И ПРИНЯТИЯ РЕШЕНИЙ

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Аннотация. В статье проводится анализ технологии RPA и её места в процессах управления и принятия решения. Целью данной работы является анализ различных источников по вопросам использования и внедрения данной технологии для оценки текущего состояния исследований в данной сфере, а также построение модели динамики для последующего анализа возможности применения технологии в будущем. Первая часть работы посвящена анализу научных работ в различных сферах исследования технологии RPA. Были проанализированы как англоязычные, так и русскоязычные источники. На основе данной части работы были сделаны выводы о текущем состояние исследования, а также выводы о положении RPA в сфере автоматизации и рисках, которые связаны с использованием рассматриваемой технологии. Вторая часть работы посвящена выделению показателей и построению моделей процесса до и после внедрения, а также модели динамики процесса с использованием технологии RPA. На основе данной части работы были сделаны выводы о практическом влиянии RPA на ход процесса, а также выводы о возможности преобразования и использования модели в будущем. Результатом данной работы являются сгруппированные исследования по теме RPA с выводами о состоянии RPA, особенностями этой технологии, а также возможностями для её применения, а также модели процесса и динамики, на основе которых сделан вывод о возможности применения RPA в процессах управления и принятия решения.

Ключевые слова: RPA, управление процессами, автоматизация процессов, роботы, процесс управления, процесс принятия решений, искусственный интеллект, модель динамики

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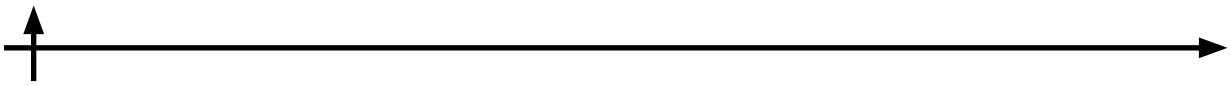
Introduction

The field of RPA (robotic process automation) technology is understudied, as the technology is new to the automation market. However, it is worth noting that the increased interest in process automation is allowing the technology to develop rapidly. This increases the number of scientific papers on the subject every year.

Let us characterize the technology. The original definition of the word "robot" was as follows: a universal automaton for performing mechanical actions similar to those performed by a human performing physical work (Yurevich, 2018), but the modern concept of this definition is somewhat different from the now obsolete ones. The first robots were created to replace humans in arduous and hazardous tasks, thereby reducing risk to workers' lives and increasing efficiency in the work performed. Modern robots, on the other hand, are capable of performing information tasks and have artificial intelligence, which allows them to be used not only in heavy mechanical tasks, but also in process automation.

"Process" or "process" is a word that everyone is familiar with, but different sources give different definitions of this concept. For example, GOST R ISO 9000:2008 defines process as "a set of interrelated



or interacting activities that transform inputs into outputs" ("GOST R 9000-2008. Quality management systems. Basic provisions and dictionary," 2009, pp. 9000–2008).

"Automation" is also a concept that is gaining traction in the current era of digitalization of enterprises. "Automation is the application of technologies and methods to partially or completely exclude humans from participating in an automated process. The main purpose of automation is to improve labour efficiency" (Fursenko et al., 2007). "Robotic process automation" or "robotic process automation" technology is a collection of images of virtual robots that perform various service tasks previously performed by humans. In business processes RPA is software that performs the tasks of unloading and transferring data from various systems used in the enterprise (CRM, ERP etc.), performing e-mail distributions, creating electronic documents and reports etc. (Madakam et al., 2019).

Some of the most popular vendors in the world in the RPA technology market include: IBM, UiPath, WorkFusion, AUTOMATION ANYWHERE, openspan 5 and BluePrism (Lavrov and Petyuk, 2017). Although it is difficult to identify a leader in such a dynamic market, many experts believe that UiPath is the leader at the moment due to their awareness and financial capability.

Materials and Methods

First of all, articles that raise the issue of the prevalence of this technology both in Russia and in the world at large, as well as examples of successful application of RPA technology were studied. It should be noted in advance that the theoretical side of technology research is raised in most articles.

The article "Robotic Process Automation (RPA)" describes the essence of the technology, the basic prerequisites for its use and diffusion, and also briefly describes and compares the current state of robotic process automation in Russia and abroad. In Russia RPA is just emerging and there are several problems associated with the technological state of the processes in organizations, low labour costs and other factors. The author reports that the number of successful applications of this technology in Russia is currently very low, however, one of the companies using this technology is X5. This information contrasts with the fact that RPA is already used in the public sector in some countries (Belomittsev, 2019).

The article "Utilizing robotic process automation technologies for streamlining the additive manufacturing design workflow" reveals an algorithm for selecting a framework for applying RPA technology to manufacturing within an additive manufacturing model to improve the optimality of basic manufacturing processes. In this study, the framework was deployed in a real enterprise. The main goal was to reduce the cost of production and to reduce the likelihood of human error (George et al., 2021). The article "Applying robotic process automation (RPA) in auditing: A framework" describes the benefits of using the developed framework. (Huang and Vasarhelyi, 2019) describes the benefits of using the RPA solution developed in the course of the study in the field of auditing. The authors single out the following as the main benefits: freeing auditors' time to perform more complex tasks, reducing human error in auditing, increasing the quality of auditing by reducing outsourcing.

In "Robotic process automation at Xchanging" the authors describe features of using RPA-technology shortly after direct implementation on the basis of experience of company-vendor and business process integrator Xchanging. Based on these experiences, the authors highlight the following features of process automation using modern technology (Willcocks et al., 2015a). Continuous improvement, which maximizes the benefits of implementing RPA technology. Voluminous repetitive tasks are better performed by robots, as the possibility of human error is eliminated. A robot can outperform a human in terms of quality, speed and error rate, but can only work at the pace at which the overall process allows it, which means the following: the robot is still constrained by process conditions, just like a normal human (Willcocks et al., 2015a). To maximize the efficiency of RPA implementation, both the IT architecture and the processes themselves must be improved continuously. The authors of "Robotic process automation at Telefonica O2" describe the characteristics of RPA technology after direct implementation based on the experience of a telecommunications company. The authors show the current effectiveness

of RPA, as well as predictions that the use of RPA technology will bring even greater benefits to the company.

The company's experience has shown that early adopters of RPA have to take a number of risks. For example, the authors point out that it is necessary to make sure that the growth rate of the company's own IT infrastructure is sufficient to match the growth rate of the level of automation in the enterprise. The following situation has occurred in the enterprise. Initially the facility had only 20 robots, allowing it to operate at optimum capacity, but as the number of robots increased the load on the mainframe became too great, leading to a system crash. The authors of the article reflect: "It was like driving a Ferrari with a lawnmower engine" (Lacity et al., 2015). The article "Robotic automation of auxiliary processes of RF radioelectronic industry enterprises under pandemic conditions" was also reviewed. The purpose of the authors' work was to solve the problem of task performer replacement in a pandemic environment through the use of RPA-system at the enterprise of radioelectronic industry. The article describes the peculiarities of the electronic industry enterprises, the list of tasks performed by robots in this enterprise, which include: creating and moving files, emulating pressing buttons, filling and copying forms, downloading data from external and internal sources, comparing and checking data, performing mathematical operations, text recognition (Zherenakov et al., 2020).

In addition, works on the specifics of deployment and interaction of RPA with other automation technologies in enterprises have been studied. The authors of "Robotic Process Automation" described the stages of process automation in the enterprise using RPA technology. The main criteria for system selection were also considered: functionality, configurability, scalability, infrastructure, and ease of use by end users (Lavrov and Petyuk, 2017). In their paper "Robotic Process Automation and Artificial Intelligence in Industry 4.0 - A Literature review" the authors consider the possibility of integrated application of ML, AI and RPA technologies. The synergy of these technologies will allow to use RPA more effectively and expand the area of processes in which this technology can be applied. The authors also identified criteria for selecting a suitable RPA based on their objectives for the set of technologies under investigation. These criteria included: recognition, level of optimization provided, classification, information extraction, computer vision, fuzzy matching, neural networks, solver trees, fuzzy logic, NLP (Ribeiro et al., 2021).

The paper "Early evidence of digital labour in accounting: Innovation with Robotic Process Automation" explores the features of RPA implementation. The author highlights that providing technical capabilities is only part of the RPA implementation process, and that organizations benefit from automating structured, repetitive, rule-based processes with digital inputs. The author reports that along with cost savings, organizations gain improved process documentation, fewer errors and better quality reports (Kokina and Blanchette, 2019).

The article "Process Mining and Robotic Process Automation: A Perfect Match" presents an example of joint use of process analytics technology and RPA. The authors point out that such combination of technologies allows increasing company's efficiency indicators in case of correct implementation and combination of technologies. The paper also proposes the author's approach for successful combination of the technologies studied in the paper. Briefly, the approach can be described by the following points: selection of a suitable use case; standardization of business processes of the enterprise to facilitate RPA implementation; prioritization of use cases in the context of limited resources; creation of a central unit of the organization to manage the RPA unit; constant monitoring of results and improvement of processes and technologies (Geyer Klingeberg et al., 2018).

The author of the article "RPA - Modern Business Process Automation Technology" talks about the different options for deploying RPA tools: auxiliary automation and full autonomy of the robot from the employee. The article provides examples for each type of automation and presents descriptions of different types of RPA robots. The author identified the following robots: an assistant robot, which requires human intervention to use; an autonomous robot that performs tasks without human control (Kuzmin,

2020).

A separate item worth highlighting are papers whose main idea is to investigate the risks of RPA implementation and to identify and solve possible problems that may arise during the implementation of RPA. For example, the paper "Main Problems in the Implementation of Robotic Process Automation (RPA) Solutions" examines the problems encountered during implementation, the main reasons for their occurrence, methods for solving problems, as well as ways of developing RPA technology in light of the possibility of new difficulties in implementation and development and ways to overcome them. The author identifies the following problems. Firstly, a lack of understanding of the process and its steps by implementers. As a solution to this problem, it was proposed to engage consultants to help analyze the process and provide professional commentary on it.

The second problem was the lack of understanding by the key users of the technology and how it would be used in their process. The solution to this problem is to educate the end users of the future RPA system and related technologies in advance, which will prepare staff for the changes in the process and information infrastructure of the enterprise (Belomittsev, 2019). The authors of other articles also highlight other problems. For example, the article "Main aspects and challenges of robotic process automation" highlights challenges such as the lack of a clear vision of the end goal of automation. It is believed that these difficulties could be overcome by the previously described method of training personnel to better understand the purpose of automation and its place in the process to be automated. Another problem highlighted by the authors is problems with defining the steps for implementing RPA and neglecting already proven techniques for implementing the technology. This problem is not unique to RPA technology, but is encountered in almost any enterprise process automation. One of the reasons for this problem is the testing of automation on a small business process and the desire to automate individual tasks that are not linked, resulting in patchwork automation (Arkhipov, 2019).

Another paper that describes the risks and problems of RPA implementation is "Risks of implementing RPA technology in a knowledge-intensive enterprise". The following risks are highlighted: the problem of process analysis; employee adaptation; the direct development of RPA; the cost of implementation; and maintenance. Solutions to some of the problems presented have already been proposed, but it is worth highlighting the problem of maintenance and RPA development (Badmayeva and Pererva, 2020). These problems can be solved by outsourcing RPA development and support. This solution will be most relevant for small and medium-sized enterprises. One source of information on the potential challenges that need to be addressed in the implementation of RPA is the paper "Robotic Process Automation: Contemporary themes and challenges". The paper describes the latest RPA technology at the time of writing, and provides a research programme on RPA applications in the form of solutions to 15 practical problems that need to be solved during implementation. Examples of such challenges are: infrastructure evaluation mechanisms, methodological support for implementation, socio-technical implications, allocation of sufficient benefit indicators, etc. (Syed et al., 2020).

The issue of internal problems with miscommunication of company structures when developing and implementing RPA is addressed in depth in the article "The IT function and robotic process automation". The authors describe and answer questions about one of the major problems that can arise when implementing RPA - a misunderstanding between the IT department and the client department. The authors answer questions that can arise from unfamiliarity with basic technology terms. For example, the first starting point is that customers are not dealing with a physical robot. However, it is a software robot, not ordinary software. The authors draw the following analogies.

"The RPA 'developer' customises the RPA software, whereas the IT 'developer' writes the software code.

"Analyst" RPA is a process expert who actively seeks automation opportunities and usually writes detailed RPA requirements, whereas the typical "business analyst" serves as a link between user needs and IT requirements (Willcocks et al., 2015b).

Results and Discussion

First of all, we would like to note the low level of development of RPA technology and the prevalence of its application in Russia. This fact is confirmed as the texts of the articles analyzed in the data, namely the paragraphs relating to the analysis of the domestic market and comparing it with foreign, and the extremely difficult process of finding information and scientific sources on the subject. It should also be noted that there are very few voluminous scientific papers on the topic.

Based on information from Russian-language scientific papers, it was concluded that the low prevalence of this technology is related to the risks entailed by the implementation of this technology, as well as the difficulties in its implementation. For example, many companies are just beginning to move to a high level of digitalisation, and for the application of RPA technology, this is one of the key factors. It has been noted that all the features and complexities are well understood by researchers in research papers related to the problems I have described above, which shows that RPA technology is slowly starting to penetrate the domestic market as well. More and more vendors of this technology are appearing among Russian and CIS companies.

It is also worth noting that Russian-language sources provide a number of examples of the use of technology in various areas of industry and services. Based on the analysis of English-language sources, it was concluded that among English-speaking researchers the problem is more elaborated. As in Russian-language sources, foreign researchers in their works often analyse the features of implementation and problems that may arise in the implementation and use of RPA technology. In some papers, authors describe a comparison of automation technologies, e.g. BPM and RPA. However, authors also cite examples of combined use of BPM and RPA technologies, as well as complementing RPA with AI, ML, CI and other technologies, which demonstrate a high level of RPA development potential and potential synergies with other technologies. Examples of the use of the technology in various fields, from banking to telecommunication, are also given.

English-language studies pay a lot of attention to the problem of optimising RPA algorithms and robots. Researchers create methodologies for choosing decision-making frameworks in various industries and services, and create mathematical models to optimize RPA by reducing the number of robots used in the work, which markedly reduces the cost of enterprises when using this technology. The authors also focus not only on the technical challenges of implementing the technology. For example, there are studies focusing on the linguistic problem of implementation, namely the problem of overlapping the terms RPA and IT in general.

The growing interest in RPA is also noted in many articles. For example, one article reports that according to Google Trends, interest in robot-assisted process automation has increased more than 5-fold in the last 5 years (Jovanovic et al., 2018). Based on the data collected from various sources, a study was conducted on the feasibility of RPA technology. To better understand the problem, a small case study was compiled in the form of models of the document management process before and after the implementation of RPA technology in the enterprise. These models are presented in Figures 1 and 2.

As can be seen from the model, the processes of obtaining signatures and processing documents are performed manually, which can entail both the risk of human error and increase the duration of rather simple sub-processes.

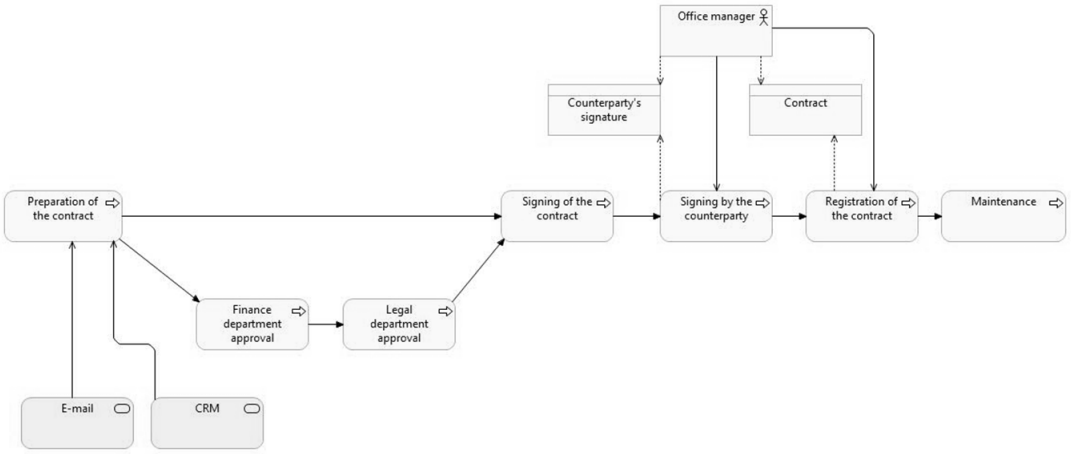


Fig. 1. Model of a document management process “as is”

As you can see from the model in Figure 2, the machine now solves these sub-processes, freeing the office manager from these tasks. These models are just a small example of the benefits of using RPA in enterprises.

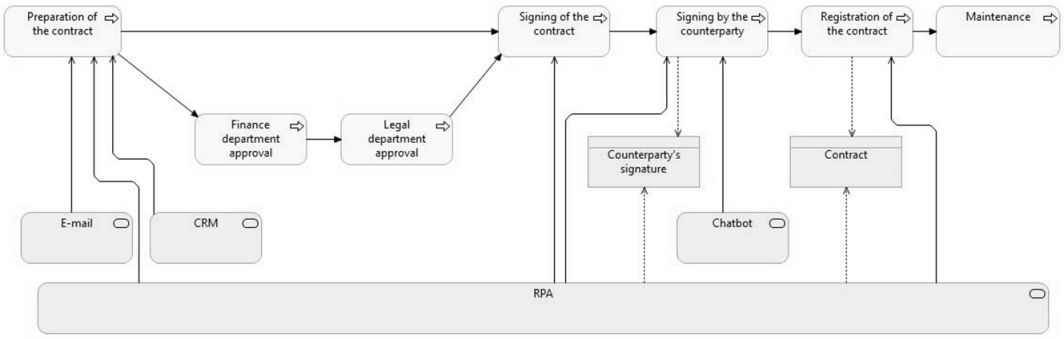


Fig. 2. A model of the “to be” document management process

A system dynamics model was also drawn up as part of the study. The purpose of this model is to predict and visualise the effect of RPA on the execution of the company's key processes. For this purpose, process cumulators and an accumulator demonstrating the overall work performed were generated. Figure 3 shows an example of model formation for 1 process. Figure 4 shows the complete model for all core processes of the company.

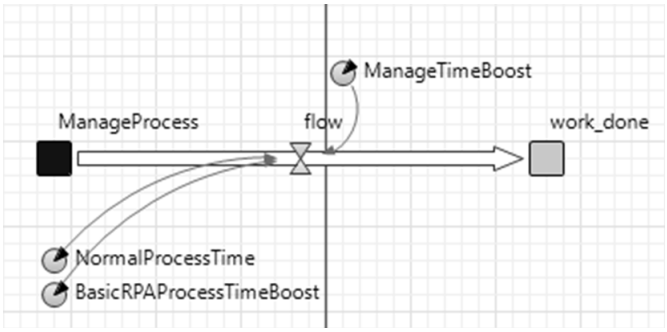


Fig. 3. Example of a model for a single process

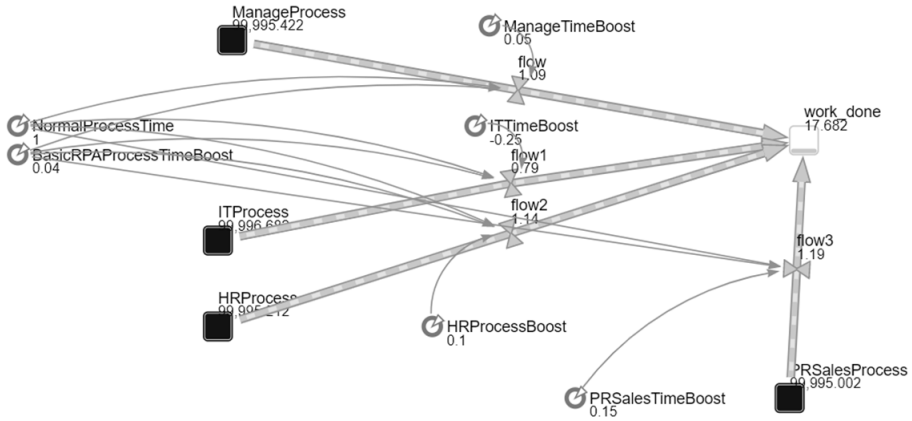


Fig. 4. Model of the impact of RPA on the speed of execution of a company's core processes

This model demonstrates the impact of the application of RPA technology on the speed of execution of a unit of process work. Table 1 will provide a list of variables with their descriptions.

Table 1. Variables and drivers of the model

Variable	Value	Description
NormalProcessTime	1	Describes the base rate of completion of a unit of work during the company's processes.
BasicPRAProcessTimeBoost	0.04	A measure of the acceleration of a unit of work that is common to all processes. It was obtained through peer review.
ManageTimeBoost	0.05	Shows the process unit of work acceleration for management processes.
ITTimeBoost	-0.25	Shows the impact of using RPA in the IT processes in the company. This is due to the increased workload on the IT department due to the need to support the new system.
HRProcessBoost	0.1	Shows the process unit of work acceleration for HR processes.
PRSalesTimeBoost	0.15	Shows the process unit of work for acceleration for sales processes.
ManageProcess	100000	Shows the number of work units of management processes. Examples of processes are strategic initiative management process, business plan management, organizational development management, quality management, inventory control, etc.
ITProcess	100000	Number of work units of IT processes. Examples of processes are RPA system support and management, information systems support and management, database support and management, technical support, maintenance, etc.
HRProcess	100000	Number of work units of HR processes. Examples of processes are processing resumes and applications, HR analytics, personnel records, training and development of personnel, recruitment
PRSalesProcess	100000	Number of units of work of sales processes. Examples of processes are processing applications, finding clients, attracting clients, processing, and creating documentation, etc.
work_done	0	The total number of completed units of work for all processes represented in the model. Examples of such processes would be all the above examples.

The drives are affected by 2 types of variables: variables common to all processes; process-specific variables.

The common variables are NormalProcessTime and BasicPRAProcessTimeBoost. A value of 1 was chosen for NormalProcessTime because this variable describes the basic process execution speed against which the effect of RPA failure is viewed. For BasicPRAProcessTimeBoost, a value of 0.04 (Fursenko et

al., 2007; "GOST R 9000-2008. Quality management systems. Basic provisions and dictionary," 2009) was selected based on the sources analysed earlier in this paper. These variables are shown in Figure 5.

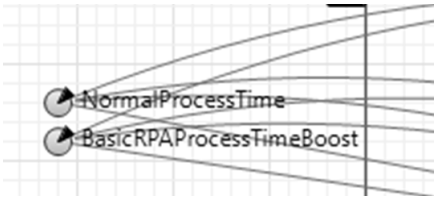


Fig. 5. Common variables

As can be seen from the figure, there are a large number of links from these variables to all the flows present in the model.

For specific variables, an analysis of sources was also carried out to select the most accurate parameters according to expert opinion (Asquith and Horsman, 2019; Flechsig et al., 2022; Lacity et al., 2015; Willcocks et al., 2015a). The values of these variables are presented in Table 1. Visually, these variables are presented in Figure 6. The relationships of the variables in question are highlighted in red.

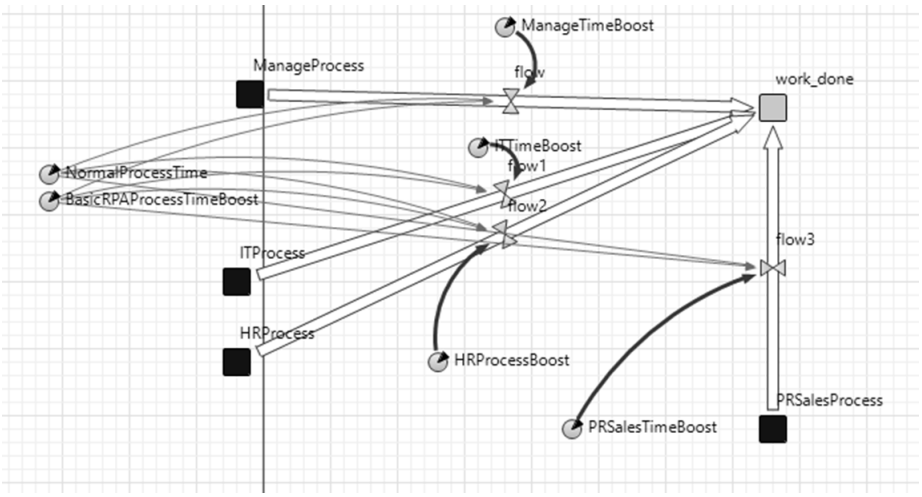


Fig. 6. Visualisation of relationships of specific variables

The impact of the variables on the respective drive streams is presented in Table 2.

Table 2. Influence of variables on drive streams

Aggregator	Influential variables
ManageProcess	NormalProcessTime, BasicPRAProcessTimeBoost, ManageTimeBoost
ITProcess	NormalProcessTime, BasicPRAProcessTimeBoost, ITTimeBoost
HRProcess	NormalProcessTime, BasicPRAProcessTimeBoost, HRProcessBoost
PRSalesProcess	NormalProcessTime, BasicPRAProcessTimeBoost, PRSalesTimeBoost
work_done	There are no influencing variables because this is the end of the process

Based on the results of this model, it can be concluded that the impact of RPA on the core processes of the company fully covers the risks associated with the implementation and use of this technology. The visual component of the model qualitatively reflects the impact on speed when the model is run in parallel with ManageTimeBoost, ITTimeBoost, HRProcessBoost, PRSales and TimeBoost parameters

"zeroed". In this case, the only parameter affecting the model remains NormalProcessTime. Thus the model will run in a simulation where RPA is not used. The execution speed of processes in such a system will be baseline. If the results of expert evaluation of RPA impact change (for example, in case the system is augmented with new functions), the expert may change the coefficients of variables and compare the old model with the new one.

Conclusions

Various scientific sources related to RPA and other technologies which facilitate the automation and operation of RPA systems have been reviewed in this paper. From the information obtained the following conclusions about the technology have been made. It is a developing technology worldwide, and in Russia many companies are sceptical about this innovation.

RPA-systems are extremely demanding not only on the infrastructure of the company, but also on its financial resources, as well as the management, which must be clearly aware of the purpose of the technology. The technology is suitable for any kind of enterprise and can be used there, from banking and public sector to heavy industry and small business. The implementation of the technology contributes to the IT development of the company, because as the number of robots used in RPA increases, so does the quality of the company's IT infrastructure.

The technology has great synergy potential with other emerging technologies: machine learning and neural networks. In the course of this work, a system dynamics model of the impact of RPA systems on the speed of execution of company processes was built. From this model it can be concluded that this technology is a powerful tool in the hands of a skilled manager. However, this technology requires serious IT support.

REFERENCES

Asquith A., Horsman G. 2019. Let the robots do it! – Taking a look at Robotic Process Automation and its potential application in digital forensics. Forensic Science International: Reports, 1-54. DOI: https://doi.org/10.1016/j.fsir.2019.100007

Badmayeva A.D., Pererva O.L. 2020. The risks of introducing RPA technology at a high-tech enterprise. Scientific result. Economic research 6. DOI: https://doi.org/10.18413/2409-1634-2020-6-3-0-6

Belomittsev I.O. 2019. Robotized process automation (RPA). Innovative science.

Flechsig C., Anslinger F., Lasch R. 2022. Robotic Process Automation in purchasing and supply management: A multiple case study on potentials, barriers, and implementation. Journal of Purchasing and Supply Management, 28. DOI: 100718. https://doi.org/10.1016/j.pursup.2021.100718

Fursenko S.N., Yakubovskaya E.S., Volkova E.S. 2007. Automation of technological processes. BSATU.

George A., Ali M., Papakostas N. 2021. Utilising robotic process automation technologies for streamlining the additive manufacturing design workflow. CIRP Annals 70, 119–122. DOI:https://doi.org/10.1016/j.cirp.2021.04.017

Geyer-Klingeberg J., Nakladal J., Baldauf F., Veit F. 2018. Process Mining and Robotic Process Automation: A Perfect Match. Presented at the International Conference on Business Process Management.

GOST R 9000-2008. Quality management systems. Basic provisions and dictionary. 2009.

Huang F., Vasarhelyi M.A. 2019. Applying robotic process automation (RPA) in auditing: A framework. International Journal of Accounting Information Systems 35, DOI: https://doi.org/10.1016/j.accinf.2019.100433

Jovanovic S.Z., DJuric J.S., Sibalija T.V. 2018. Robotic process automation: overview and opportunities. International Journal Advanced Quality 46, 34–39.

Kokina J., Blanchette S. 2019. Early evidence of digital labor in accounting: Innovation with Robotic Process Automation. International Journal of Accounting Information Systems. https://doi.org/10.1016/j.accinf.2019.100431

Kuzmin A.A. 2020. RPA-Prodigic technology for automation of business processes. Science and

Education Today.

Lacity M., Willcocks L.P., Craig A. 2015. Robotic process automation at Telefonica O2. LSE Research Online Documents on Economics, LSE Research Online Documents on Economics.

Lavrov V.S., Petyuk S.I. 2017. Robotized process automation. Scientific notes of young researchers.

Madakam S., Holmukhe R.M., Jaiswal D.K. 2019. The Future Digital Work Force: Robotic Process Automation (RPA). JISTEM J.Inf.Syst. Technol. Manag. 16. DOI: https://doi.org/10.4301/S1807-1775201916001

Ribeiro J., Lima R., Eckhardt T., Paiva S. 2021. Robotic Process Automation and Artificial Intelligence in Industry 4.0. HCist 2020 - International Conference on Health and Social Care Information Systems and Technologies, 51–58. DOI:https://doi.org/10.1016/j.procs.2021.01.104

Syed R., Suriadi S., Adams M. 2020. Robotic Process Automation: Contemporary themes and challenges. Computers in Industry 115. DOI:https://doi.org/10.1016/j.compind.2019.103162

Willcocks L.P., Lacity M., Craig A. 2015. Robotic process automation at Xchanging. LSE Research Online Documents on Economics, LSE Research Online Documents on Economics.

Willcocks L.P., Lacity M., Craig A. 2015. The IT function and robotic process automation (LSE Research Online Documents on Economics). London School of Economics and Political Science, LSE Library.

Yurevich E.I. 2018. Fundamentals of robotics, 4th ed. BHV-Peterburg.

Zherenakov A.B., Kogan D.A., Semenenko E.D. 2020. Robotized automation of auxiliary processes of enterprises of the electronic industry of the Russian Federation in the context of the pandemic. Innovative technologies: theory, tools, practice 1.

СПИСОК ИСТОЧНИКОВ

Asquith A., Horsman G. 2019. Let the robots do it! – Taking a look at Robotic Process Automation and its potential application in digital forensics. Forensic Science International: Reports, 1-54. DOI: https://doi.org/10.1016/j.fsir.2019.100007

Бадмаева А.Д., Перерва О.Л. 2020. Риски внедрения технологии RPA на наукоемкое предприятие. Научный Результат. Экономические Исследования 6. DOI: https://doi.org/10.18413/2409-1634-2020-6-3-0-6

Беломытцев И.О. 2019. Роботизированная автоматизация процессов (RPA). Инновационная Наука.

Flechsig C., Anslinger F., Lasch R. 2022. Robotic Process Automation in purchasing and supply management: A multiple case study on potentials, barriers, and implementation. Journal of Purchasing and Supply Management, 28. DOI: 100718. https://doi.org/10.1016/j.pursup.2021.100718

Фурсенко С.Н., Якубовская Е.С., Волкова Е.С. 2007. Автоматизация технологических процессов. БГАТУ.

George A., Ali M., Papakostas N. 2021. Utilising robotic process automation technologies for streamlining the additive manufacturing design workflow. CIRP Annals 70, 119–122. DOI:https://doi.org/10.1016/j.cirp.2021.04.017

Geyer-Klingeberg J., Nakladal J., Baldauf F., Veit F. 2018. Process Mining and Robotic Process Automation: A Perfect Match. Presented at the International Conference on Business Process Management.

ГОСТ Р ИСО 9000-2008 Системы менеджмента качества. Основные положения и словарь. 2009.

Huang F., Vasarhelyi M.A. 2019. Applying robotic process automation (RPA) in auditing: A framework. International Journal of Accounting Information Systems 35, DOI: https://doi.org/10.1016/j.accinf.2019.100433

Jovanovic S.Z., DJuric J.S., Sibalija T.V. 2018. Robotic process automation: overview and opportunities. International Journal Advanced Quality 46, 34–39.

Kokina J., Blanchette S. 2019. Early evidence of digital labor in accounting: Innovation with Robotic Process Automation. International Journal of Accounting Information Systems. https://doi.org/10.1016/j.accinf.2019.100431

Кузьмин А.А. 2020. RPA - современная технология автоматизации бизнес-процессов. Наука

и образование сегодня.

Lacity M., Willcocks L.P., Craig A. 2015. Robotic process automation at Telefonica O2. LSE Research Online Documents on Economics, LSE Research Online Documents on Economics.

Лавров В.С., Петюк С.И. 2017. Роботизированная автоматизация процессов. Научные записки молодых исследователей.

Madakam S., Holmukhe R.M., Jaiswal D.K. 2019. The Future Digital Work Force: Robotic Process Automation (RPA). JISTEM J.Inf.Syst. Technol. Manag. 16. DOI: https://doi.org/10.4301/S1807-1775201916001

Ribeiro J., Lima R., Eckhardt T., Paiva S. 2021. Robotic Process Automation and Artificial Intelligence in Industry 4.0. HCist 2020 - International Conference on Health and Social Care Information Systems and Technologies, 51–58. DOI:https://doi.org/10.1016/j.procs.2021.01.104

Syed R., Suriadi S., Adams M. 2020. Robotic Process Automation: Contemporary themes and challenges. Computers in Industry 115. DOI:https://doi.org/10.1016/j.compind.2019.103162

Willcocks L.P., Lacity M., Craig A. 2015. Robotic process automation at Xchanging. LSE Research Online Documents on Economics, LSE Research Online Documents on Economics.

Willcocks L.P., Lacity M., Craig A. 2015. The IT function and robotic process automation (LSE Research Online Documents on Economics). London School of Economics and Political Science, LSE Library.

Юревич Е.И. 2018. Основы робототехники, 4 изд. БХВ-Петербург.

Жернаков А.Б., Коган Д.А., Семененко Е.Д. 2020. Роботизированная автоматизация вспомогательных процессов предприятий радиоэлектронной промышленности РФ в условиях пандемии. Инновационные технологии: теория, инструменты, практика 1.

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DEVELOPMENT OF CUSTOMER LOYALTY PROGRAMS AT HOSPITALITY ENTERPRISES UNDER DIGITALIZATION

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Abstract. The hotel industry today is one of the fastest growing and profitable areas that are represented on the modern market. New hotels are emerging, the level of competition is growing, and therefore hotel managers are forced to come up with and introduce new programs to encourage and stimulate regular customers. The purpose of the study is to characterize the incentive and incentive programs in the hotel business, the stages of forming customer loyalty programs at enterprises, as well as analyzing the incentive and incentive programs for regular customers in the context of digital transformation. In the course of the research, an analysis of various marketing tools was carried out, a classification of existing loyalty programs was given. As a result of the study, recommended approaches to creating a regular customer incentive program in hotels are presented, allowing for a closer understanding between company representatives and customers. In addition, the study revealed the most common rewards that customers prefer, actions that the customer is willing to do to receive bonuses, as well as disadvantages of existing loyalty programs that do not suit customers when participating in the program.

Keywords: loyalty programs, loyalty, marketing, bonus programs, marketing tools, digitalization of business, hotel business

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ФОРМИРОВАНИЕ ПРОГРАММ ЛОЯЛЬНОСТИ КЛИЕНТОВ НА ПРЕДПРИЯТИЯХ ИНДУСТРИИ ГОСТЕПРИИМСТВА В УСЛОВИЯХ ЦИФРОВОЙ ТРАНСФОРМАЦИИ

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Аннотация. Гостиничная индустрия сегодня представляет собой одно из самых быстроразвивающихся и приносящих весомый доход направлений, которые представлены на современном рынке. Появляется все больше новых гостиниц, растет уровень конкуренции, в связи с чем руководители гостиниц вынуждены придумывать и вводить новые программы поощрения и стимулирования постоянных клиентов. Целью исследования является характеристика программ поощрения и стимулирования в гостиничном бизнесе, этапы формирования программ лояльности клиентов на предприятиях, а также проведение анализа программ поощрения и стимулирования постоянных клиентов в условиях цифровой трансформации. В процессе исследования проведен анализ различных маркетинговых инструментов, дана классификация существующих программ лояльности. В результате исследования представлены рекомендуемые подходы к созданию в гостиницах программы поощрения постоянных клиентов, позволяющие установить более тесное взаимопонимание между представителями компании и клиентами. Помимо этого, в результате исследования выявлены наиболее распространенные вознаграждения, которые предпочитают клиенты, действия, которые готов сделать клиент для получения бонусов, а также недостатки существующих программ лояльности, которые не устраивают клиентов при участии в программе.

Ключевые слова: программы лояльности, лояльность, маркетинг, бонусные программы, маркетинговые инструменты, цифровизация бизнеса, гостиничный бизнес

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Introduction

The hotel industry today is one of the fastest growing and profitable areas that are represented on the modern market. What makes hotel managers fight for a place and offer conditions that will attract customers more than the conditions of competitors. In this regard, hotels create and introduce loyalty programs. These programs are not only simple in their execution, but also beneficial for hotel guests. Sometimes, it is the benefits that the customer receives in the loyalty program that can affect the choice of a place for his vacation. Based on this, it can be said that it is important for hotel managers to research and plan the effectiveness of their programs that can create a competitive advantage. Currently, more and more new hotels are appearing on the hotel services market, the level of competition is growing, and therefore hotel managers are forced to come up with and introduce new programs to encourage and stimulate regular customers. Hotel owners were the first to start using loyalty programs. Customer retention is the main task that the loyalty program should solve. Customer loyalty and trust can be achieved in various ways. Such as: a regular customer card, a gift, a discount, a special promotion, an exclusive souvenir, etc. Using these methods helps to create a strong customer base and leave a positive impact on

the client.

Any guest can be a potential regular customer. This is facilitated by excellent service and respect for the guest. Loyalty programs can bring the first results in a month after its introduction. Regular customers are the basis and guarantee of the future loading of the hotel. In the conditions of the modern market of hotel services, managers of Russian and foreign hotels are acutely aware of the need to use loyalty programs. These programs can not only keep regular customers, but also attract new ones, and also show customers the image of the hotel. The best method of obtaining commitment and guest satisfaction is service. Well-designed programs also enhance the service culture and increase the credibility of the hotel in the eyes of potential guests. For any hotel, creating customer loyalty is a top priority in the conditions of digitalization of the economy.

Organizations that carry out their activities in various business areas strive to achieve loyalty from their customers – insensitivity to the actions of competitors and the creation of trusting relationships with the brand. To achieve this goal, companies use a variety of marketing tools, one of which is a loyalty program, the essence of which is to create a desire for the client to choose a hotel where he has already been when choosing a place to stop (Shalygin, 2018). To create and implement a loyalty program, it is necessary to think through all the details, calculate costs, and take into account possible risks. These actions are a procedure that is the most important stage in the development of marketing on the way to the implementation of programs.

In this regard, marketers are faced with the following tasks:

1. To study the types of programs that already exist on the market;

2. Identify their advantages and disadvantages;

3. Choose the most profitable option for your organization, which will not only be affordable, but also profitable

4. After the implementation of the programs, monitor its existence and adjust it if necessary.

The loyalty program is a complex of marketing activities aimed at creating long–term and profitable relationships with guests. The main purpose of the programs is to encourage the consumer, call for repeated visits, which is accompanied by the appearance of an emotional connection with the organization in the client. The emotions that will be aroused in the client as a result of participating in the loyalty program "force" him to choose not a "profitable" product, but the one to which his soul lies. This is a big difference from rational choice, when the customer pays attention to the price-quality ratio. Consumer loyalty can be divided into behavioral and perceived.

1. Behavioral loyalty – it can be defined as the variability of the customer's purchasing activity. If the customer significantly increases the number of his purchases, purchases additional goods of the company (cross-purchases), increases the amount of costs for this category of goods. Thanks to the data of the client's actions, it is not difficult to calculate behavioral loyalty, since such consumer behavior is displayed in the financial report of the organization's activities.

2. Perceived loyalty is the degree of customer satisfaction and awareness, which can be measured by conducting surveys among hotel customers. The results of the surveys are subjective and may not always reflect the reason for the influence on the customer's purchasing behavior. However, they cannot be ruled out, since they provide an understanding for the marketer about the reason for the emergence of loyalty and make it possible to predict a possible change in demand.

The greatest effect can be achieved if we consider both types of loyalty together, taking into account the customer's satisfaction in connection with his client activity in the future. With the help of a variety of combinations of these indicators, you can create a system of loyalty types. Many organizations direct the activities of marketers to increase the number of consumers who are representatives of the true type of loyalty. However, at present, in the experience of various organizations, false loyalty is increasingly manifested among customers, which usually appears due to the limited supply or due to a habit that has been developed in the client's family, the consequence of which is repeated customer purchases made in

the absence of a high level of satisfaction with services or products (Liljenberg, 2014).

Materials and Methods

For the study, such methods as comparative, synthesis of various components into a single whole, the method of analogy (Determination and formation of identical properties of the subject), the method of deduction and the method of generalization, for example, the formation of conclusions about the general properties of the subject of research, were used.

Results and Discussion

For the competent implementation of the loyalty program of the organization, it is necessary to study its customers. In order to get to know the company's customers, it is necessary to study the target market, which is a group of people or companies (for the B2B market) who are consumers of goods or services provided by the organization, i.e. those who are most often consumers of services or products of this company. For marketers, the target market is of particular importance, due to the fact that since it contains information about the characteristics of potential or existing buyers, it can also provide a complete picture for understanding the desires of customers and forming a marketing strategy that will adapt to their needs. It is necessary to characterize the target market in order to determine the type of loyalty program that will suit a particular organization, depending on the selected business segment (The Loyalty Factory Community, 2016; Vlasova et al., 2012a). The target customer, with certain actions on the part of the organization, can become a loyal customer. Loyalty can also be called a positive attitude of the client to all components of the company's activities, which includes the image of the organization, the attitude of staff to consumers, the goods/services provided by the company themselves, and even trademarks and logos. This positive attitude of the consumer to the organization, in other words, loyalty, is a necessary component for a stable sales volume. Consequently, the loyalty effect is a necessary component in the formation of advantages over the company's competitors.

Using the loyalty characteristic, it is possible to determine the value of consumer loyalty and determine the components that it includes. Consumer loyalty is a consumer's dependence on this organization, which is expressed by the habit of using one service on a regular basis or purchasing the same product, while rejecting alternative options and not paying attention to the price of the service / product (Vlasova et al., 2012b). This loyalty represents an advantage of the organization over competitors. The peculiarity of consumer loyalty is that when the assortment of goods provided by the organization changes, its characteristics or conditions of sale change, the number of loyal consumers will not only not decrease, but in some cases even increase. With the help of these characteristics, it can be concluded that organizations need to study the target group of consumers of its products for the further positive existence of the company. Organizations need to adjust their activities to the demand created by consumers.

If the organization understands its customers correctly, it opens up the following opportunities:

1. opportunities to predict customer needs;
2. the ability to identify the products or services of the organization that customers use the most;
3. the opportunity to create and subsequently improve the relationship of the organization with potential customers;
4. the ability to gain the trust of customers by understanding the needs of consumers;
5. the ability to understand why a consumer makes a decision and purchases a particular product;
6. the ability to get information about what the customer uses for purchases (website, store, app, etc.);
7. the ability to determine the factors that affect the customer's decision when he is going to purchase a product or service of the organization;
8. the opportunity to develop a marketing strategy based on the data obtained, which will be effective

and efficient;

9. the ability to establish feedback with consumers of the organization's services;

10. and the main opportunity for the organization is that it is able to establish effective work with consumers of its services.

In order to form the best understanding of their customers, marketers use 3 principles (Belyaeva, 2016):

– the client is an independent person;

– in order to determine the motives of the organization's customers, it is necessary to conduct behavior studies;

– consumer behavior is socially legitimate.

Marketing can be considered as customer orientation using the following definitions:

1. for an organization, the first priority phenomenon is the customer's need:

– dependence lies in the fact that when the consumer's needs are met, the chance of his return in the future increases;

– the most important goal of marketers remains to meet the needs of consumers.

2. the needs of consumers are an object of constant observation by marketers, as well as an object on which research in the field of science can be carried out. Therefore, the knowledge of the consumer of their goods/services provides an opportunity for the organization to find the necessary levers to meet the needs of the client;

3. conducting marketing research. These studies should be carried out on an ongoing basis in regular periods:

– the development and introduction of new products/services should take place in a timely manner;

– it is necessary to immediately record changes in consumer needs.

4. it is necessary to conduct a study of the ratio of advantages and disadvantages of the organization with high frequency: it is necessary to correctly calculate the further actions of the organization – it is necessary to direct forces to emphasize the positive sides and eliminate the second;

5. it is necessary to pay attention to long-term planning: the organization needs to predict possible changes in customer needs and develop an appropriate algorithm of actions by using marketing opportunities;

6. marketers should know how to evaluate the goods / services of the organization: the development of advertising of these products / services is based on these estimates;

7. it is necessary to establish cooperation between the departments of the organization: the dependence lies in the fact that the improvement of customer service and satisfaction directly depends on effective cooperation;

8. it is necessary to establish and maintain cooperation with organizations that are related, the dependence is that the better and better the cooperation, the more satisfied the consumer will become;

9. change should be perceived by the organization as an inevitability, which is not in vain: which means that it is necessary to adapt to changes, not resist them.;

10. the range of services provided by the organization should be expanded. The meaning of this principle is that the organization must take into account the variability of the environment and provide new opportunities that lead to better customer service. The result of this activity is the transformation of improved customer relationships into capital;

11. Organizations should evaluate their capabilities in marketing-related activities on a regular basis:

– the costs of the organization that it allocates for the organization of the activities of marketing specialists should be used effectively;

– effective marketing programs and strategies are developing due to the variability of the envi-

ronment and the business of hotel services, but there is also a repetition.

In the activities of marketers both domestic and foreign in the management of the organization of the hotel industry, the use of integrated marketing is spreading. This type of marketing is a complex of tactical solutions. These solutions are necessary to determine the necessary marketing actions of the organization in the hotel services market (Evgrafov et al., 2017). Integrated marketing is one of the most necessary and, most importantly, effective tools of any marketing department of an organization. The marketing complex has 4 components:

1. product;
2. promotion;
3. price;
4. staff.

In order to get the emotion of hotel guests necessary for the organization in the form of a reaction, it is necessary to use these components comprehensively. Organizations use proven tools and methods in the course of their activities to achieve the necessary returns from customers. The complex of these factors makes up the marketing mix (marketing complex). The term "marketing mix" was first introduced by Neil Borden in 1953 during a presidential address to the American Marketing Association. This complex includes a combination of these four components. Experts assumed that if you use a complex combination of these factors in a variety of ways, you can get a variety of results in the organization's activities in the market (Voronova et al., 2019).

In 1960, Jerome McCarthy proposed classifying these elements, calling this classification "4P":

– product (product) – that is, the goods actually produced or the services provided;

– price - pricing that will be optimal for both the seller and consumers. As well as providing discounts to customers;

– place (bringing the product to the consumer) – which implies retail outlets, distribution channels, etc.;

– promotion (product promotion) is an algorithm of actions that is able to convey information about the benefits of a product / service to potential customers, which may help them create a desire to purchase them. The main idea of promoting goods / services or the organization itself is to create marketing relationships with individual consumers (for example, through advertising, PR).

Based on the data presented above, we can conclude that the McCarthy marketing mix concept can be defined by a set of marketing elements that are the basis and included in the marketing program. However, at present, the traditional marketing concept called "4P" is losing its effectiveness, which means that it becomes irrelevant. In this regard, this concept is called traditional, as it is one of the first, but at the moment it is being replaced by a new one, which is focused not on the organization, but on the client. The name given to the new concept "4C":

1. consumer. This category includes both direct consumers of the organization's products, but also includes persons who only make a decision about a possible purchase. And also those in this category can include those who are influenced by the consumer in terms of making a purchase decision;

2. the cost (cost) or the money that the client is willing to spend on the purchase of goods / services;

3. convenience - goods/services should satisfy not only the basic needs of customers, but also bring additional benefits. And also influence the emotional state of the client;

4. communication – this includes all communication channels between the organization and the client (Belyaeva, 2016; Ilyina and Mikhailova, 2017).

Statistics produced by global organizations show that since the beginning of the 20th century, all organizations have been fighting for 3 types of customers:

1. Customers who are loyal to the organization. This type of clients, having chosen one trademark, remain faithful to it, despite various persuasions. In some cases, the loyalty of this type of consumers may be illogical. It mainly depends on the emotional or psychological dependence on the goods/services

of the organization. It may take more than one year for clients of this type to change their preferences, but there is a possibility that this may not happen;

2. Customers who move from one organization to another. These include those buyers who can be influenced by advertising or the opinion of relatives, friends, and therefore they are easily able to switch to another organization;

3. Customers who are indifferent to any organizations. This type does not show loyalty to any organization. Their desire to buy something is mainly influenced by the price of the product/service (Voronova et al., 2019).

In this connection, the attention of marketers is completely transferred from the product / service to the consumer. The most important factor is the establishment of a long and fruitful relationship with the buyer.

Loyalty programs can be classified through the principle of encouraging the consumer, that is, by the types of his remuneration, whether it be bonuses, discounts or gifts. Currently, the most popular method of remuneration is the discount received when using discount cards. However, domestic and foreign organizations use many other incentive systems, sometimes combining several types at the same time. It is also possible to characterize programs, both tangible and intangible. The first ones are discounts, bonuses, etc., and the intangible ones include other privileges, including the opportunity to participate in various events held by the organization. Currently, most organizations use material loyalty programs in their activities, due to the fact that such programs are perceived by consumers as a benefit.

The main classification of loyalty programs:

1. Discount programs

This program is more widespread among Russian companies than others. It is based on a system of discounts. The main meaning of the discount program is to provide the consumer with goods / services of the organization that participates in this program with economic benefits, which consists in providing a discount (i.e., reducing the price of the service / product) when visiting again. Currently, in addition to the plastic cards that the client receives if he wants to participate in the program at the time of making a purchase, the consumer has the opportunity in some organizations to get an electronic card that will be available in the official application or in other electronic servers. Also, to attract new customers, a discount coupon is provided, which is one of their types of discount program, but it is not designed to establish long-term relationships with the consumer. The provision and the amount of discount that a discount card can offer depends on a variety of conditions, such as the time of purchase, the size of the purchased product / service, the history of relations with this buyer. To date, such a discount system is replaced by a fixed discount amount on the card, which helps to reduce the number of expenses of the organization and lead to an increase in sales. At the moment, in the service market, such discount systems replace cards with a fixed discount size, which helps to reduce the company's costs and increase its sales volume.

The main advantage of the discount program is the simplicity of its implementation and the budget of its implementation. However, the simplicity of its use is also a disadvantage, as it generates the main drawback of this loyalty program - redundancy in the existing market. In this regard, the organization is not able to make its customers absolutely loyal, due to the fact that the discount card is offered at many points engaged in similar activities, which leads to the fact that the customer who participates in the discount loyalty program continues to pay attention to the activities of competitors, as well as the consumer who does not have a card. Due to the presence of this disadvantage at the present time, discount systems are replaced by more modern programs in the hotel services market, which are more thoughtful and unique (E-pepper.ru, n.d.). As a subcategory of this program, we can single out a cumulative discount program, the meaning of which is to encourage the buyer for the regularity of purchases and their price. The main goal is to create an emotional attachment of the client, creating an atmosphere of competi-

tion, in which the discount provided is the victory.

Summing up, we can say that discount programs have considerable effectiveness in the implementation of behavioral loyalty of customers, which affects the financial statements of the organization's activities. But due to the fact that this type of program is very common and does not create true loyalty, but false, this program is currently outdated.

2. Bonus programs

The essence of these programs also consists in accumulation. The main feature of the bonus program before the discount is that the accumulated points or bonuses are not converted into a discount and do not lead to an increase in its size, but lead to the exchange of these bonuses for additional services of the organization, for the purchase of its goods / services or receiving an exclusive prize for redeemed points. The main feature of this program is that the client himself has the right to dispose of his bonuses and he is able to independently choose the gift or product/ service he needs.

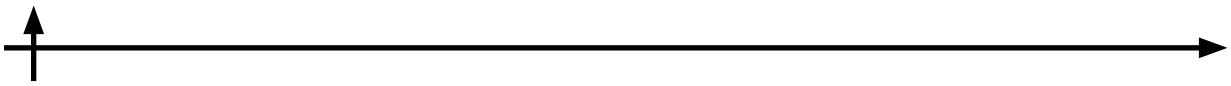
The bonus program has in its foundation a process similar to the definition of the game. If the client "participates" in this game, then as a result, the organization "wins" and receives a "prize" in the form of its client's emotional attachment to the process of obtaining the necessary points. Rationality is the second special detail in the program, expressed in the process of retaining customers. Which is expressed in the fact that the accumulated points in one organization are of particular value to the client, which actually forces him to apply to the same company, since he is a player there, which makes it difficult for him to move to competitors. However, despite the visible advantages, it is worth considering that the costs of the organization are significantly increased. This is due to the fact that some of the buyers who will use the accumulated points in the future are small. Bonus programs provide an opportunity for the organization to hold promotional events without directly providing discounts to the client. In return for this benefit, the consumer acquires the opportunity to multiply their accumulated points. In connection with the use of these actions, the organization is able to reduce its expenses, which, accordingly, will lead to an increase in revenue.

The visible disadvantage of this type of program is that for its implementation, the organization will have to spend significantly. The costs will be associated with the development and creation of a voluminous information system. This system will not only collect, but also sort information about consumers. She will also be able to provide the organization with information about their amounts and the size of their purchases, as well as deals with calculations and accrual of bonuses to customers. A significant disadvantage for the client participating in this program is the possible burning of his accumulated points and the inability to use them in the future. This situation will cause negative emotions in the consumer, as well as lead to the loss of a client participating in the program, who in the future will speak negatively about this organization. In this regard, the organization's marketers need to stipulate these conditions and provide an opportunity for customers to familiarize themselves with the validity periods of their accumulated bonuses. In conclusion, it can be concluded that the bonus program is effective in increasing customer loyalty and retaining them, thanks to emotional and a= rational attachment. However, to implement the bonus system, the organization will need to allocate significant funding, and its implementation may lead to negative precipitation when the bonuses accumulated by the client are burned.

3. Coalition Loyalty Program

One of the options for increasing consumer loyalty is a coalition or multi-brand program. Its essence lies in the fact that incentive tools such as bonuses, prizes or discounts are provided when buying from different organizations that are partners. The purpose of this loyalty program is to attract and retain the consumer at the expense of another company. The advantages of the coalition program are collective responsibility for the emotional state of the client, large coverage of potential clients and delegation of authority between the participants of the program.

However, today in Russia it is rare to find an example of the successful functioning of this program, due to the presence of a number of shortcomings. Problems can arise and most often arise at almost all



stages of its creation. One of the significant drawbacks is the fact that during the creation of a group of program participants, it is likely to conclude an agreement with a partner who will try to transfer clients to his side. For organizations that have a weak position in the existing market, this program will be ineffective due to the lack of a high level of recognition. One of the reasons for non-participation of the consumer or refusal to participate in the process may be the layered picture of a complex and incomprehensible system of providing "benefits". But we can say that the disadvantage of this type of loyalty is that the client does not have the opportunity to increase the level of his loyalty to only one organization. This situation occurs due to the fact that the customer's loyalty arises not to the goods / services that the organization is able to provide, but to the very essence of the program. As a result, we can say that the introduction of a multi-brand loyalty program can and most likely will be accompanied by a large number of possible failures and difficulties. However, failures can accompany any projects. Everything will depend on competent management.

4. Special terms of service, privileges

The essence of this program is that the organization should create a sense of individual approach for the client. This effect can be achieved by granting exclusive privileges to special clients. In this case, unique offers can have a huge variety. The organization can provide a separate room for service in the office, provide a specialist for the client to organize an individual selection of goods / services individually for the client, and sometimes it may consist in free service in the business halls of hotels. These programs are provided only for proven and long-term cooperation clients, and therefore they require significant expenses. However, this particular legibility is an advantage for the organization, since an exclusive attitude and an individual approach are applied only to those customers who are absolutely loyal to the organization. The main difference between this program and the discount program is selective work with loyal customers and an increase in expenses for the target group, whereas the discount program is designed for mass consumption. Among the disadvantages, there is a rather high cost, which becomes a big problem during a crisis — in such cases, companies have to cut down on customer opportunities, limiting access to special service conditions.

Consequently, this loyalty program is designed for consumers who are absolutely loyal to the organization and is able to retain them by providing them with a sense of exclusivity. However, there may be a risk associated with unscrupulous customers, in connection with which the organization may have problems with increasing costs.

5. Outstanding service, CRM system

The essence of this loyalty system is to create a database of customers, where information about them, their tastes and desires will be stored, which will help to anticipate emerging needs during future visits. With this system, you can prepare for a guest's visit, for example, remove coffee from breakfast, knowing that the guest prefers tea. This type of information is collected and classified in specialized CRM systems. For the client, this hike provides expectations for the provision of the desired high level of service in any hotel chain. The essence of the program is to create an emotional attachment of the consumer to the organization and should cause him a sense of exclusivity. Knowledge and respect for the individual habits and desires of the client becomes the decisive link for rejecting the offers of other companies acting in this niche of the market. This type of program is much more effective than the previous ones, because it is able to cause brand satisfaction and is able to increase customer activity, which is achieved by anticipating customer needs. Any program has both advantages and disadvantages. The disadvantages of this loyalty program are the problems of collecting and selecting the necessary data to create a database, as well as the costs of storing and maintaining a huge amount of information. Grouping data provides a particular difficulty, in view of the ambiguity of client behavior. Specialists need to determine what is the habit of the client, and what he preferred to choose once. As a result, there may be a misunderstanding, which may lead to consumer dissatisfaction. In this regard, this program implies adaptation to the needs of a loyal client, and should not anticipate his desires, since they can be

changeable. An exception may be long-standing regular customers whose tastes and preferences have not changed for several years. This program is very effective, due to the fact that it causes absolute loyalty in the consumer. During the activity of this program, specialists need to act with extreme caution and show customers the most individualized solutions.

The types of loyalty programs listed above contain both advantages and disadvantages, and therefore the organization has a difficult choice that will determine the further activities of the organization in this direction. The stages of implementation of the selected loyalty programs require competent planning and analysis of their effectiveness. Incentive programs for regular hotel guests can be increasingly found in Russian (domestic) hotels. A marketing strategy is successful if it is aimed at retaining and attracting new guests, increasing the average percentage of hotel occupancy, as well as increasing its attractiveness in the eyes of corporate consumers.

Domestic hotels that are not part of large foreign chains of hotels retain their customers through various incentive and incentive programs. Company managers should take into account the fact that one of the main goals that an organization should strive for is to attract and retain regular customers. However, since the program is implemented only in one hotel, and not in the network, it leads to the impossibility of using some privileges, since they will not be so attractive to the client, and therefore the programs in such hotels work a little differently. Also, a factor affecting the variability of the program is the absence of a non-network hotel contract with airlines, which creates a reluctance to participate in various discount programs for consumers of hotel services. In this regard, we can draw a small conclusion that incentive programs in hotels of this type are aimed more at attracting VIP status customers, as well as at creating a positive image of the brand in the eyes of the consumer.

Naturally, in order to introduce various kinds of loyalty programs, domestic marketing specialists equally use both their own achievements and the experience of foreign companies that have been acquired in this area during the period of using such programs. The variability of the choice of approach to increase the loyalty of hotel customers for hotels that differ in organizational form and class of service is presented in Table 1.

Table 1. Recommended approaches to creating a regular customer incentive program in hotels

The qualities of the loyalty program	Description of qualities
Goal	Acquisition of a base of regular consumers of a service/product
Consumers	The program should be designed in such a way as to be able to satisfy the needs of any consumer of a service / product, i.e. it should be democratic
Time-limited qualities	The program must be designed for a certain amount of time for the consumer (outside of this interval, incentive points burn out)
Classification of consumers	The number of accumulated points (points) provide different types (levels) of encouragement
Availability of partners with similar programs	The presence of partnerships with other hotels or organizations, that is, the creation of a common group to meet the needs of consumers
Availability of "VIP" clients	For customers with absolute loyalty to the brand – the creation of an "elite club", which will become a motivation and an indicator of prestige

To create and determine the best actions aimed at meeting the needs of the client participating in the program, which will allow establishing mutual understanding with him, organizations currently use the following means:

1. Organizations use additional financial benefits in their relationship with their client.

2. They use additional social benefits together with them in order to strengthen the created relationships with their client, analyzing the needs. That will allow him to provide individually selected services

in the future.

3. Organizations are establishing structural connections to financial and social benefits. Which means that for customers who stay at this hotel more often than others, more additional services are provided than others.

To stimulate the loyalty of the hotel client, it is necessary to involve the client in the activities of the hotel, as well as provide him with service in accordance with his needs, which will help establish personal and informational ties with him and create a psychological and emotional sense of attachment.

The hotel in its activities is additionally recommended to keep records of repeated requests from guests to the official website of the organization in the telecommunications network "Internet" In order to implement this action, the hotel must create a special program. Such a program will collect, store and generate all information about guests who prefer to contact through the official website of the organization to book a place. Due to the availability of this information about the customers participating in the loyalty program, the hotel is able to generate a newsletter with exclusive offers for its hotel services, as well as congratulate on various holidays at the email addresses of customers, which is also an individualization of the relationship with the client.

The organization of letters through mailing lists to regular customers, continuous communication with them, as well as their personification should occur throughout the entire period of the organization's relationship with the client, starting with the idea of booking a place in a hotel, ending with his stay in a hotel. However, consumers are still not satisfied with the complex conditions of loyalty programs. The pattern lies in the fact that obtaining benefits requires expending a large amount of effort, which can cause a deterioration in the client's attitude to the organization. In this connection, when creating and implementing customer incentive programs, hotels need to find a balance between time and difficulties in order to obtain benefits, and, of course, take into account the emerging wishes of consumers. The longer the client waits for the cherished offer, the less motivation he has for further actions.

According to the annual survey on the attitude of consumers to loyalty programs Loyalty Barometer Report - 35% of consumers of hotel services show a desire to receive additional options, as well as to use advanced tools to search for the necessary goods or services. The main incentives for consumers to participate in incentive programs have been and remain free goods/services and discounts. Therefore, managers should not abandon these formats of providing prizes and discounts when creating incentive programs, as they can help strengthen relationships with consumers. these incentives act for clients as an indicator that the organization appreciates them, but it should be borne in mind that free gifts cannot completely replace permanent bonuses or discounts.

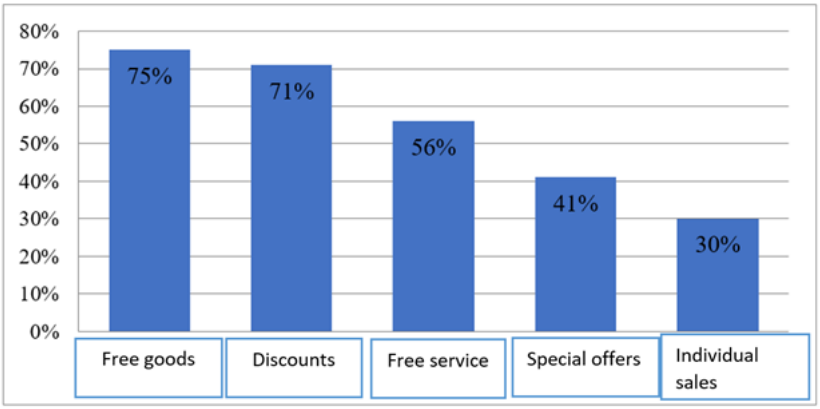


Fig. 1. Rewards preferred by customers

For the client participating in the incentive program, the preferred form of remuneration remains receiving benefits in exchange for points. Consumers show a desire to accumulate more bonuses, which means they are looking for more ways to earn them. In 2021, compared to last year, the use of coalition (multi-brand) programs by organizations increased. Creating links with other partner brands in general incentive programs provides the client with the opportunity to earn and spend more points accordingly. According to the study, in 2021, the gifts that a regular customer receives from brands gave way to permanent (fixed) rewards and the return of a percentage of the purchase, they appear to be "transparent" rewards in the eyes of the buyer. Unexpected rewards are valued more by customers when they are an additional position in the incentive program, rather than being a fixed offer.

The desire to accumulate more bonuses encourages consumers to contact the organization more often, participate in surveys conducted by it, use the mobile application (if there is one) and be an active user in the official networks of the organization. the organization can use this activity to receive feedback, feedback and strengthen its position in the information space, raising the rating of the organization (AMBASSADOR; “Interfax”; “Official website of the Committee for Tourism Development of St. Petersburg,”).

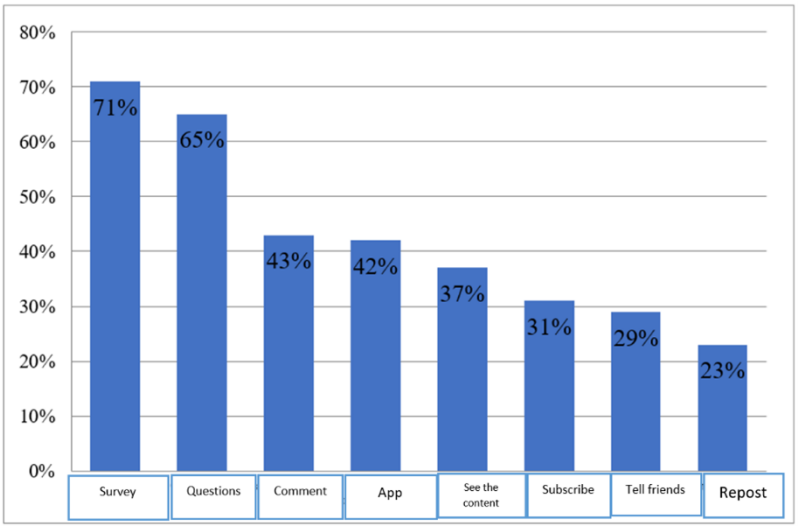


Fig. 2. Actions that the client is ready to do to receive bonuses

Conclusion

Studies conducted with participants of various incentive programs for regular customers have revealed what does not suit customers when participating in the program.

1. Complex rules

Loyalty program participants often refuse to participate due to the complexity of the conditions for receiving bonuses and the time that needs to be spent to accumulate them. In order to avoid losing a potential participant in the program, organizations need to simplify the rules and tell more about the benefits of participating in it.

2. Useless rewards

According to the study, many consumers are dissatisfied with the fact that they can receive unnecessary, useless gifts for the accumulated bonuses. In connection with these organizations, it is necessary to offer their clients only what will help strengthen their emotional connection with the organization or become a necessary gift for them.

3. Spam

Over the past year, the number of program participants who complained about spam from the organization decreased from 36% to 23%. However, spam is still one of the main disadvantages of the programs

according to buyers. Currently, organizations are trying to send only the information they need to the client, but the need for personalization continues to grow – consumers do not want to receive mass mailings from the organization. To solve this complexity, organizations need to indicate in the newsletter not only information about the client and the amount of bonuses accumulated by him, but also information about the offers available to him.

REFERENCES

Belyaeva E.T. 2016. Types of loyalty programs. Scientific research, 45–50.

Chudnovskiy A. 2021. Using the Digitalization Experience of Small Enterprises of the Tourism and Hospitality Sector in Germany for Development of the Tourism Infrastructure in Russia. Socio-economic Systems: Paradigms for the Future, 369-376. DOI 10.1007/978-3-030-56433-9_39

E-pepper.ru, n.d. E-pepper.ru [WWW Document]. e-pepper. URL e-pepper.ru/ (accessed 10.12.22).

Evgrafov A.A., Ilyina O.V., Mikhailova G.V. 2017. Services in foreign economic activity: economic nature, growth trends and development problems. Proceedings of the St. Petersburg State University of Economics, 38–44.

Ilyina O.V., Mikhailova G.V. 2017. Features of the life cycle of goods and services in international trade from a marketing perspective. Practical Marketing, 26–30.

Interfax [WWW Document], n.d. URL http://www.group.interfax.ru/ (accessed 09.02.23).

Kizildag M. 2019. Blockchain: a paradigm shift in business practices. International Journal of Contemporary Hospitality Management, 953-975. DOI 10.1108/IJCHM-12-2018-0958

Liljenberg A. 2014. Customer Loyalty Program: examples and tips for business.

Nuseir M. T. 2022. The effects of facilitating conditions, customer experience and brand loyalty on customer-based brand equity through social media marketing. International Journal of Data and Network Science, 875-884. DOI 10.5267/j.ijdns.2022.2.009

Official website of the Committee for Tourism Development of St. Petersburg [WWW Document], n.d. URL https://www.gov.spb.ru/gov/otrasl/c_tourism/ (accessed 10.02.23).

Povorozniuk I. 2022. Digitalization as the basis of the development of enterprises in the hospitality industry. Sciences of Europe, 20-23. DOI 10.5281/zenodo.7298644

Serra-Cantallops A. 2018. The impact of positive emotional experiences on eWOM generation and loyalty, 142-162. DOI 10.1108/SJME-03-2018-0009

Shalygin M.A. 2018. Hotel business development in St. Petersburg: history, problems and solutions. The age of science, 154–158.

Sparks B. 2007. Providing an Explanation for Service Failure: Context, Content, and Customer Responses, 241-260. DOI 10.1177/1096348006297292

Tajeddini K. 2022. How self-gratification and social values shape revisit intention and customer loyalty of Airbnb customers. DOI 10.1016/j.ijhm.2021.103093

The Loyalty Factory Community. 2016. Coalition Loyalty Programs: Advantages and disadvantages.

Tideswell C. 2004. Developing and Rewarding Loyalty to Hotels: The Guest"s Perspective, 186-208. DOI 10.1177/1096348003261219

Vlasova M.S., Ilyina O.V., Morokhina V.I. 2012. Development of a methodology for calculating the integral indicator of assessing the potential of an educational institution. Society. Environment. Development, 19–25.

Vlasova M.S., Ilyina O.V., Morokhina V.I. 2012. The current state and trends in the development of personnel training in the state and non-state sectors of the education system. Society. Environment. Development, 23–28.

Voronova O.V., Khareva V.A., Khnykina T.S. 2019. Current trends in the development of the services market of the Russian Federation in the context of digital transformation (on the example of the hospitality industry). International Scientific Journal, 19–25.

СПИСОК ИСТОЧНИКОВ

Беляева Е.Т., 2016. Виды программ лояльности. Научные исследования, 45–50.

Chudnovskiy A. 2021. Using the Digitalization Experience of Small Enterprises of the Tourism and Hospitality Sector in Germany for Development of the Tourism Infrastructure in Russia. Socio-eco-

nomic Systems: Paradigms for the Future, 369-376. DOI 10.1007/978-3-030-56433-9_39

E-pepper.ru [электронный ресурс]. URL e-pepper.ru/ (дата обращения: 10.12.22).

Евграфов А.А., Ильина О.В., Михайлова Г.В. 2017. Услуги во внешнеэкономической деятельности: экономическая природа, тенденции роста и проблемы развития. Известия Санкт-Петербургского государственного экономического университета, 38–44.

Ильина О.В., Михайлова Г.В. 2017. Особенности жизненного цикла товаров и услуг в международной торговле с позиции маркетинга. Практический маркетинг, 26–30.

Interfax [электронный ресурс]. URL http://www.group.interfax.ru/ (дата обращения: 09.02.23).

Kizildag M. 2019. Blockchain: a paradigm shift in business practices. International Journal of Contemporary Hospitality Management, 953-975. DOI 10.1108/IJCHM-12-2018-0958

Лильенберг А. 2014. Программа лояльности клиентов: примеры и советы для бизнеса.

Nuseir M. T. 2022. The effects of facilitating conditions, customer experience and brand loyalty on customer-based brand equity through social media marketing. International Journal of Data and Network Science, 875-884. DOI 10.5267/j.ijdns.2022.2.009

Комитет по развитию туризма Санкт-Петербурга [электронный ресурс], n.d. URL https://www.gov.spb.ru/gov/otrasl/c_tourism/ (дата обращения: 10.02.23).

Povorozniuk I. 2022. Digitalization as the basis of the development of enterprises in the hospitality industry. Sciences of Europe, 20-23. DOI 10.5281/zenodo.7298644

Serra-Cantallops A. 2018. The impact of positive emotional experiences on eWOM generation and loyalty, 142-162. DOI 10.1108/SJME-03-2018-0009

Шалыгин М.А. 2018. Развитие гостиничного бизнеса в Санкт-Петербурге: история, проблемы и пути решения. Эпоха науки, 154–158.

Sparks B. 2007. Providing an Explanation for Service Failure: Context, Content, and Customer Responses, 241-260. DOI 10.1177/1096348006297292

Tajeddini K. 2022. How self-gratification and social values shape revisit intention and customer loyalty of Airbnb customers. DOI 10.1016/j.ijhm.2021.103093

Сообщество «Фабрика Лояльности». 2016. Коалиционные программы лояльности: преимущества и недостатки.

Tideswell C. 2004. Developing and Rewarding Loyalty to Hotels: The Guest"s Perspective, 186-208. DOI 10.1177/1096348003261219

Власова М.С., Ильина О.В., Морохина В.И. 2012. Разработка методики расчета интегрального показателя оценки потенциала образовательного учреждения. Общество. Среда. Развитие,19–25.

Власова М.С., Ильина О.В., Морохина В.И. 2012. Современное состояние и тенденции развития подготовки кадров в государственном и негосударственном секторах системы образования. Общество. Среда. Развитие, 23–28.

Воронова О.В., Харёва В.А., Хныкина Т.С. 2019. Современные тенденции развития рынка услуг Российской Федерации в условиях цифровой трансформации (на примере индустрии гостеприимства). Международный научный журнал, 19–25.

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AUTOMATED MANAGEMENT SYSTEMS: PROBLEMS OF IMPLEMENTATION AND INTEGRATION

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Abstract. In the context of the digital transformation of the economy at various enterprises, the issue of effective and rational information management is acute. The modern day requirements indicate that for the stable functioning of even small companies, it is necessary to clearly control the work, keep records and manage the flow of information. The relevance of the development of automated control systems is determined by the need to introduce an electronic document management system at enterprises, caused by large volumes of work with documents, searching, approving, coordinating documents, saving time, ensuring information security and improving executive discipline for the controllability of technological processes. In the course of the study, issues related to the problems of introducing information systems in enterprises were considered. Integration problems are not limited to software, they cover the entire IT infrastructure of the enterprise, which should provide the ability to integrate not only software components, but also the business processes it serves without losing flexibility and scalability. As a result of the study, it was revealed that the integration of new information systems will help to obtain a number of advantages over competitors in the local market, as well as speed up the processing of requests on the company's website.

Keywords: information system, integration, implementation of IT systems, process management, information services

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АВТОМАТИЗИРОВАННЫЕ СИСТЕМЫ УПРАВЛЕНИЯ: ПРОБЛЕМЫ ВНЕДРЕНИЯ И ИНТЕГРАЦИИ

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Аннотация. В условиях цифровой трансформации экономики на различных предприятиях остро встает вопрос эффективного и рационального управления информацией. Требования времени говорят о том, что для стабильного функционирования даже небольших компаний необходимо четко контролировать работу, вести отчеты и управлять потоками информации. Актуальность разработки автоматизированных систем управления определяется необходимостью внедрения системы электронного документооборота на предприятиях, вызванной большими объемами работы с документами, поиском, утверждением, согласованием документов, экономией времени, обеспечением информационной безопасности и повышением исполнительской дисциплины для контролируемости технологических процессов. В процессе исследования рассмотрены вопросы, связанные с проблемами внедрения информационных систем на предприятиях. Проблемы интеграции не ограничиваются только программным обеспечением, они охватывают всю ИТ - инфраструктуру предприятия, которая должна обеспечить возможность интеграции не только программным компонентам, но и обслуживаемым ею бизнес-процессам без потери гибкости и масштабируемости. В результате исследования выявлено, что интеграция новых информационных систем поможет получить ряд преимуществ перед конкурентами на локальном рынке, а также ускорить обработку запросов на сайте компании.

Ключевые слова: информационная система, интеграция, внедрение IT-систем, управление процессами, информационные сервисы

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Introduction

Developing technologies are the main reason for the creation of new enterprises. When a business grows, information technologies can come to the rescue and make it easier, or vice versa, improve the operation of the enterprise. It is possible to create a symbiosis that will guarantee the correct operation and timely implementation of the company's activities. The purpose of this study is to identify the weaknesses of the company "Autoross" and features in the integration of information systems in order to reorganize the business processes of the enterprise. This has become necessary due to the growth of the company and its customers, who need to always provide retail services on time and correctly assess market trends. The integration of new information systems will help to gain a number of advantages over competitors in the local market, as well as speed up the processing of requests on the company's website. The advantages will contribute to further growth, but we must be prepared to increase the dependence of the enterprise on the IP that will be implemented. This leads to increased requirements from management to the quality of systems. In addition, the management also needs to take into account that the damage from possible IP failures may increase, since it will already be more significant if compared with the traditional management model of the company.

Fig. 1 reveals the main features of the introduction of the organization in the integration of informa-

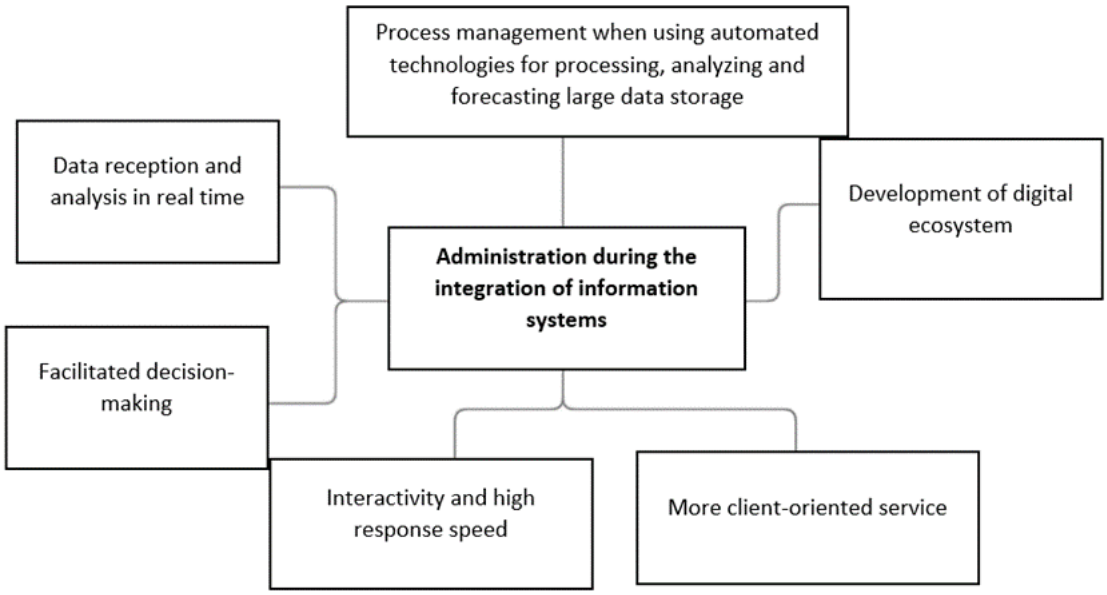


Fig. 1. Main features of IT-systems integration

tion systems.

Having studied the advantages and identified the needs for the integration of information systems, it is necessary to develop a model for the transformation of the enterprise and break it into simple elements. By observing them, the company will ensure a systematic transformation and development. Automated information system (AIS) is a set of software and hardware designed to automate activities related to the storage, transmission and processing of information. The aim of AIS is to increase productivity and labor efficiency, improve the quality of information products and services, improve service and service efficiency.

Materials and Methods

In this study, analytical methods were used, such as description, grouping of data, causal analysis, evaluation. The use of these methods allowed us to link disparate facts about the current situation in the development and evaluation of the success of business models of service companies in modern economic conditions. The methodological base of the study contains theoretical provisions of public sector economics and management, data from official sources of state authorities and includes methods of critical analysis, theoretical modeling and formalization.

Results and Discussion

The introduction of AIS into the subject area (store) will have a positive impact on the efficiency of its work: it will simplify the accounting and control of goods. But still, the AU will not be without drawbacks: energy intensity and dependence on it.

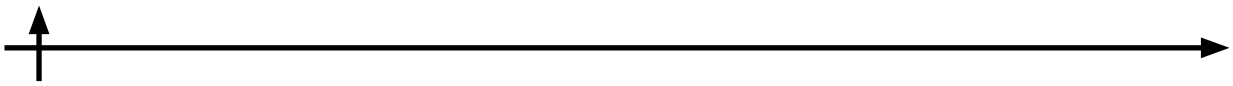
Stages of AIS development:

1. Analysis - determining what the system should do; In this case, the system is designed to monitor and process various parameters involved in the operation of the store;

2. Design - development of the structure of the future system;

3. Implementation - the implementation of the project, the creation of functional components and individual subsystems, the connection of subsystems into a single whole;

4. Testing - checking the functional and parametric compliance of the system with the indicators



determined at the analysis stage;

5. Implementation - installation and commissioning of the system;

6. Support - ensuring the regular operation of the system at the enterprise (shop).

Description of the subject area

A store is a specially equipped stationary building (part of it) designed to sell goods and provide services to customers and provided with retail, utility, administrative and household premises, as well as premises for receiving, storing goods and preparing them for sale; The main operation is the sale and accounting of goods. The product is used as the source data. The result is a sold product. Before the start of work on the technological preparation of the sale, the control of the goods that are necessary for sale is carried out. This procedure uses a large amount of manual labor. In this regard, it was decided to automate this process. Description of the process "as is now (AS IS)" Accounting is conducted by a financially responsible person. the goods being sold are not carried in cards, they reflect the number of goods in natural units. Records are made on the basis of documents on receipt or disposal of goods. After each entry, a new balance is entered in the card. At the end of each month, the statement is transferred to the warehouse for putting down the remnants of the goods, in quantitative terms at the end of the month from the inventory records cards for each item number. After that, it is transferred to the accounting department.

Disadvantages:

– Slow interaction inside the store • Loss of registration cards

– A large amount of information processed "manually"

Description of the process "how it should be (TO BE)"

Accounting is conducted by a financially responsible person. Finished products are entered into the database, they reflect the movement of goods ready for sale in natural units. Records are made on the basis of a database directly involved in the work of this department, on the receipt or disposal of goods.

Dignities:

– Reduces document flow

– Visual accounting and control of goods • Formation of accounting documentation

Disadvantages:

– Electrical system

– Risk of system failure

– Threat of system security from hacking or virus attack

In order to effectively achieve the goals of AIS, the following integration problems need to be solved during development:

1. The problem of integrated management improvement is to exclude the disunity of solving individual tasks, which leads to the fact that the issues of optimizing solutions for the system as a whole fall out of consideration.

2. The problem of decomposition of the control object is that when the automation object is divided into parts, the automation efficiency as a whole and each part separately must be carried out in compliance with their integration.

3. The problem of inter-level and intra-level integration is to establish rational ways of organizing the relationship and interaction of various levels of management, including automated control systems, CAD, OASU, etc.

4. The problem of compatibility lies in the development of internally compatible components of technical, software, information support of the IASU, externally compatible with automated systems of the upper (lower) levels of management.

5. The problem of adaptability is to ensure the ability to adapt to changing goals, organizational structure, forms and methods of management and other external and internal conditions. According to the requirements of GOST 24.104-85 [15], the adaptability of AIS should be sufficient to achieve the

established goals of its functioning in a given range of changes in application conditions.

Solving these problems involves implementing the basic concepts of an integrated automated control system, which include software integration:

– phases of the product life cycle;

– levels of the hierarchy of the management system;

– methods of aggregation of algorithms of the same type of tasks, concentration of information resources in order to effectively use the capabilities of an automated system (Fig. 2).

Name	Entity	Scope of application
Integration by phases of the life cycle	The subsystems – components of the IASU are allocated, providing management of individual phases of the life cycle (research, development, pre-production, delivery, operation, decommissioning); their compatibility and interaction are ensured in order to obtain maximum effect.	Production systems focused on mass and serial production with long-term use in various fields of activity
Integration by hierarchy levels of the management system	A complex object is divided into several simpler ones, subordinated to a superior by the corresponding control system. Coordination and management is carried out from the top down, accounting for the state from the bottom up.	Complex production systems, which include sections, workshops, productions, enterprises, associations, industries
Integration according to the frequency of solving complex tasks	The decomposition is based on the phases and periodicity of the data processing process in order to ensure maximum data processing.	Complex data processing systems as part of IASU
Integration by methods of aggregation of algorithms for solving complex problems	Data sets are allocated, the processing of which is carried out in accordance with the same type of algorithms	Frequently rebuilt production systems with variable production structureпроцесса
Integration of components of the automated part of the control system	As a part of the automated part, depending on the automation functions, functional control subsystems (CCI, OUP, etc.)	Production systems with a high level of control automation

Fig. 2. Capabilities of automated system

The essence of an integrated automated information management system is that the system being created should ensure the interconnection of automated information management systems of various levels, on a single informational, organizational, mathematical basis. The multilevel and integrative nature of the information system stems from the very essence of the management system, its structural multilevel and information interconnectedness of management structures. Arefeyev and others distinguish between horizontal and vertical integration of automated control systems. They refer to the basic principles of AIS integration:

– hierarchical construction of the system with the allocation of levels;

– unity of a centralized data bank with a set of local information databases; • unity of the formation of initial information and its repeated use;

– integration of information on requests at all levels of the organizational structure.

To ensure the operability of integrated automated control systems, communication tools are used, which serve as the basis for creating a variety of network options for automated information management systems.

In IASU, internal communication between the objects of the control system is carried out, as a rule, using automated workstations (APMs). The relationship is also carried out with the external system. Accordingly, when designing a management information support system, mutual provision of information needs for management at all levels should be taken into account. That is, when designing an information

system at the enterprise level, the needs for information support of the highest levels of management should be taken into account, and, conversely, when designing higher-level management systems, the information needs of the lower levels of management should be taken into account.

When creating an IASU, a rational combination of various types of integration should be ensured:

– functional, ensuring the coordinated performance of production, technological, organizational and economic management functions of interrelated functions. Ensures the unity of goals and consistency of all components. Establishes for each component performance criteria, functioning models, data processing procedures, functional and information links between components;

– organizational, ensuring the rational distribution of rights and responsibilities of personnel, the establishment of a certain incentive mechanism, the creation of effective "human-machine" interaction in the process of production management.

– software, ensuring the implementation of an interconnected set of models, procedures and programs of coordinated production management;

– information, ensuring the interaction of information flows on the basis of a single information base and database management system, as well as on the basis of building compatible information collection and processing systems;

– technical, providing the creation of a complex of compatible computers, automation tools, computer networks, implementing integration in distributed information processing.

IASU should be created as a complex system. The complexity of the IASU should be achieved through the rational distribution of automated functions and tasks aimed at achieving the goals of the enterprise. Automation of solving complexes of interrelated tasks should be aimed at the main management functions, which include: scientific and technical development of the enterprise, production, improvement of product quality, formation and use of resources, improvement of the organization of production and management, social development of the team, etc.

The ultimate goals of the IASU functioning cannot be achieved with unchanged management procedures and algorithms, with changing organizational, economic and technological characteristics of management objects. To implement the necessary changes in the

process of functioning of the IASU, the presence of the adaptability property. GOST 34.003-90 [18] adaptability defines how the ability of a system to change in order to maintain its operational performance in specified aisles when the external environment changes. The adaptive software of the IASU should include programs configured to change the values of the parameters of the functions performed and the conditions for solving complex tasks. The adaptation of software tools is provided by the use of high-level programming languages, application software packages and software design automation tools developed in accordance with the principles of structural programming.

Adaptive information support of the IASU should be based on unified databases, unified documentation systems, classification and coding systems, taking into account interaction with systems of hierarchy levels. Adaptive organizational support should be based on the principles of operational redistribution of staff functions, the use of organizational management procedures with overlapping functional responsibilities.

To ensure the operability of integrated automated control systems, communication tools are used, which serve as the basis for creating a variety of network options for automated information management systems.

Conclusions

The goal of automated problem solving is to eliminate the shortcomings that exist in the company, so it can be divided into two groups of sub-goals: achieving improvements in a number of economic indicators (increasing the number of clients served, reducing the number of personnel); improving the values of information processing quality indicators (increasing the degree of reliability of information process-

ing, the degree of its security, increasing the degree of automation of obtaining primary information).

This project considers the development of a new reporting form of sales statistics for the sale of goods, the development of an information and logical data model that provides an accounting, operational and quantitative summary report on the sale of goods. Prerequisites for the introduction of an information and analytical system:

1. the complexity of using large amounts of information on paper;

2. low efficiency of managers and analysts;) problems in organizing joint work on information;) possible loss of information, unreliability of storage;) lack of continuity of expert activity;) a large number of routine operations.

The effectiveness of order service management largely depends on the ability to respond correctly to market changes and make optimal decisions on planning the shipment of goods, while getting rid of a decrease in employee productivity and, as a result, a decrease in the economic efficiency of production. With the introduction of an information and analytical system, risks such as the deliberate spoiling of valuable information and the provision of deliberately distorted data are reduced.

As a result, the lack of accurate information about the state of affairs in the company, the lack of reliable reporting, which leads to a false assessment of the company's activities by the management, and unreliable reporting can lead to significant fines from the regulatory authorities of the state. Thus, in the conditions of constant development of Autoross, when making organizational and managerial decisions, the automated sales management information system being developed with the possibility of solving the problem of sales analysis is relevant. Information support is a set of data, language means of describing data, software tools, methods of organizing processing and storing arrays.

The initial data are: regulatory documents containing the article, product name, quantity of goods, order amount for each item; data for calculating sales amounts for a certain period of time. The database is being created for further integrated use. What will the implementation of the system give: – improving the efficiency of the company's management; – more efficient work and optimal use of working time; – ensuring the stability of the information flow; – improving the efficiency of the use of labor resources and increasing the productivity of employees of the enterprise; – electronic form of storage; – prevention of leakage and damage of important confidential information of various types (financial, economic, service - for internal use and other types of valuable information) – high reliability of information storage.

Thus, it can be concluded that this set of tasks for the example of sales accounting has a significant economic essence. This is a reduction in the costs of the enterprise and an increase in economic indicators as a result of an increase in the productivity of employees, which leads to the preservation of competitiveness and an increase in the economic efficiency of the company's activities.

REFERENCES

Al-Husseini Kh.A.O. 2017. Risk management tools in the design of automated Systems. INTERACTIVE SYSTEMS: Problems of Human-Computer Interaction: collection of scientific papers, 287-290

Avdeeva M., Leonova N. 2019. The automated system of models of management of information resources of higher education institution. IOP Conference Series: Materials Science and Engineering: International Scientific-Practical Conference on Quality Management and Reliability of Technical Systems 666, 012099. DOI 10.1088/1757-899X/666/1/012099

Dorr E. 2018. A Framework for digital transformation of business services. URL https://www.linkedin.com/pulse/framework-digital-transformation-business-services

Khamitova D.I. 2019. Automated Management Systems: Prospects and Problems of Use By Modern Enterprises 5, 4-12. DOI 10.17922/2412-5466-2019-5-2-4-12

Khorolsky V., Anikuev S. 2022. Concept, purpose, and objectives of building an automated power management system of an industrial enterprise. Journal of Management & Technology 22, 200-209.

DOI 10.20397/2177-6652/2022.v22i0.2382

Koutitas G., Demestichas P. 2010. Challenges for Energy Efficiency in Local and Regional Data Centers. Journal of Green Engineering 1, 1–32.

Kovalenko I.I. 2018. The Enterprise's Automated Management Stability System Taking into Account its Life Cycle Stage. Proceedings of the 2018 International Conference "Quality Management, Transport and Information Security, Information Technologies", 357-360. DOI 10.1109/ITMQIS.2018.8524966

Kul'ga K.S. 2016. Automated management of manufacturing orders. Russian Engineering Research 36, 755-759. DOI 10.3103/S1068798X16090112

Lankhorst M. 2013. Enterprise Architecture at Work, The Enterprise Engineering Series. Springer, Berlin, Heidelberg. DOI: https://doi.org/10.1007/978-3-642-29651-2

Liu C. 2016. Toward integrated and automated management of government affairs 9, 267-278. DOI 10.14257/ijhit.2016.9.1.23

Mishchenko K. Intelligent agents for automated management of user files 8, 841-851. DOI 10.12988/ces.2015.55161

Novikova T.B. 2019. Quality management of automated information systems in IT projects. IOP Conference Series: Materials Science and Engineering: International Scientific-Practical Conference on Quality Management and Reliability of Technical Systems 666, 012057. DOI 10.1088/1757-899X/666/1/012057

Oleynikova Y.A. 2021. Digital economy development problems in russia under the conditions of venture projects elevated uncertainty. Lecture Notes in Networks and Systems 200, 364-372. DOI 10.1007/978-3-030-69421-0_39.

Osterwalder A., Pigneur Y. 2010. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, 1st edition. ed. John Wiley and Sons, Hoboken, NJ.

Prokudina A., Zaychenko I. 2022. Technology development as a barrier to the implementation of the digital transformation strategy. Fundamental research in Management, economics and trade 2, 53-57.

Puzynya T. A. 2021. Virtualization technologies and information system security. Journal of Applied Informatics 16, 6-13. DOI 10.37791/2687-0649-2021-16-1-6-13

Shorfuzzaman M., Hossain M.S., Nazir A., Muhammad G., Alamri A. 2019. Harnessing the power of big data analytics in the cloud to support learning analytics in mobile learning environment. Computers in Human Behavior 92, 578–588. DOI: https://doi.org/10.1016/j.chb.2018.07.002

Yoon H. 2014. Updating the trusted connection of re-organized computing resource under the automated system management platform 70, 200-210. DOI 10.1007/s11227-014-1158-1

Zaichenko I. 2022. The role of drivers of digital business transformation in the economy. Fundamental research in Management, economics and trade, 191-193.

Zhaksylykova A. M. 2022. Organization of management of information resources of automated systems on the basis of administrative methods 53, 980-985.

СПИСОК ИСТОЧНИКОВ

Al-Husseini Kh.A.O. 2017. Risk management tools in the design of automated Systems. INTERACTIVE SYSTEMS: Problems of Human-Computer Interaction: collection of scientific papers, 287-290

Avdeeva M., Leonova N. 2019. The automated system of models of management of information resources of higher education institution. IOP Conference Series: Materials Science and Engineering: International Scientific-Practical Conference on Quality Management and Reliability of Technical Systems 666, 012099. DOI 10.1088/1757-899X/666/1/012099

Dorr E. 2018. A Framework for digital transformation of business services. URL https://www.linkedin.com/pulse/framework-digital-transformation-business-services

Khamitova D.I. 2019. Automated Management Systems: Prospects and Problems of Use By Modern Enterprises 5, 4-12. DOI 10.17922/2412-5466-2019-5-2-4-12

Khorolsky V., Anikuev S. 2022. Concept, purpose, and objectives of building an automated power management system of an industrial enterprise. Journal of Management & Technology 22, 200-209. DOI 10.20397/2177-6652/2022.v22i0.2382

Koutitas G., Demestichas P. 2010. Challenges for Energy Efficiency in Local and Regional Data Centers. Journal of Green Engineering 1, 1–32.

Kovalenko I.I. 2018. The Enterprise's Automated Management Stability System Taking into Account

its Life Cycle Stage. Proceedings of the 2018 International Conference "Quality Management, Transport and Information Security, Information Technologies", 357-360. DOI 10.1109/ITMQIS.2018.8524966

Kul'ga K.S. 2016. Automated management of manufacturing orders. Russian Engineering Research 36, 755-759. DOI 10.3103/S1068798X16090112

Lankhorst M. 2013. Enterprise Architecture at Work, The Enterprise Engineering Series. Springer, Berlin, Heidelberg. DOI: https://doi.org/10.1007/978-3-642-29651-2

Liu C. 2016. Toward integrated and automated management of government affairs 9, 267-278. DOI 10.14257/ijhit.2016.9.1.23

Mishchenko K. Intelligent agents for automated management of user files 8, 841-851. DOI 10.12988/ces.2015.55161

Novikova T.B. 2019. Quality management of automated information systems in IT projects. IOP Conference Series: Materials Science and Engineering: International Scientific-Practical Conference on Quality Management and Reliability of Technical Systems 666, 012057. DOI 10.1088/1757-899X/666/1/012057

Oleynikova Y.A. 2021. Digital economy development problems in russia under the conditions of venture projects elevated uncertainty. Lecture Notes in Networks and Systems 200, 364-372. DOI 10.1007/978-3-030-69421-0_39.

Osterwalder A., Pigneur Y. 2010. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, 1st edition. ed. John Wiley and Sons, Hoboken, NJ.

Прокудина А., Зайченко И. 2022. Развитие технологий как барьер реализации стратегии цифровой трансформации. Сборник статей участников III Всероссийской молодежной научно-практической конференции VI Уральского вернисажа науки и бизнеса 2, 191-193.

Puzynya T. A. 2021. Virtualization technologies and information system security. Journal of Applied Informatics 16, 6-13. DOI 10.37791/2687-0649-2021-16-1-6-13

Shorfuzzaman M., Hossain M.S., Nazir A., Muhammad G., Alamri A. 2019. Harnessing the power of big data analytics in the cloud to support learning analytics in mobile learning environment. Computers in Human Behavior 92, 578–588. DOI: https://doi.org/10.1016/j.chb.2018.07.002

Yoon H. 2014. Updating the trusted connection of re-organized computing resource under the automated system management platform 70, 200-210. DOI 10.1007/s11227-014-1158-1

Зайченко И. 2022. Роль драйверов цифровой трансформации бизнеса в экономике. Фундаментальные и прикладные исследования в области управления, экономики и торговли 2, 53-57.

Zhaksylykova A. M. 2022. Organization of management of information resources of automated systems on the basis of administrative methods 53, 980-985.

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DIGITAL TRANSFORMATION STRATEGY DEVELOPMENT IN AN ENTERPRISE ARCHITECTURE CONTEXT

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Abstract. Currently, the transition to digital economy opens up new opportunities for business and entrepreneurial activity, but and new challenges as well. Companies are looking for ways to transform digitally, often without sufficient information about digital technologies, as well as without a consistent approach in developing and implementing a digital strategy. Nowadays there are a number of approaches to the digital transformation, based on cross-disciplinary view, but there is an imperative for particular models and tools for digital transformation strategy development. The paper proposes framework, based on Enterprise Architecture, Capability Driven Development approach (CDD), and strategic models. Authors propose using of the developed ontologies and IT-projects portfolio management system architecture for successful digital transformation strategy development and implementation.

Keywords: Digital Transformation, Enterprise Architecture, Capability Driven Development approach, Balanced Scorecard, IT-project portfolio management system

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РАЗРАБОТКА СТРАТЕГИИ ЦИФРОВОЙ ТРАНСФОРМАЦИИ В КОНТЕКСТЕ АРХИТЕКТУРЫ ПРЕДПРИЯТИЯ

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Аннотация. В настоящее время переход к цифровой экономике открывает новые возможности для бизнеса и предпринимательской деятельности, но и также новые вызовы. Компании ищут пути цифровой трансформации, зачастую не имея достаточной информации о цифровых технологиях, а также, не имея последовательного подхода в разработке и реализации цифровой стратегии. В настоящее время существует ряд подходов к цифровой трансформации, основанных на междисциплинарном подходе, однако существует потребность в конкретных моделях и инструментах для разработки стратегии цифровой трансформации. В статье предлагается фреймворк, основанный на таких дисциплинах как архитектура предприятия, подход Capability Driven Development (CDD) а также моделях стратегического менеджмента. Авторы предлагают использование разработанных онтологий и архитектуры системы управления портфелем ИТ-проектов для успешной разработки и реализации стратегии цифровой трансформации.

Ключевые слова: цифровая трансформация, архитектура предприятия, подход к разработке на основе развития возможностей, сбалансированная система показателей, система управления портфелем ИТ-проектов

Для цитирования: Майданова С.А., Ильин И.В. Разработка стратегии цифровой трансформации в контексте архитектуры предприятия // Техноэкономика. 2023. Т. 2, № 1 (4). С. 64–75. DOI: https://doi.org/10.57809/2023.2.1.4.6

Introduction

Currently, digital technologies are becoming widespread, transforming the tools of social interaction, changing its scope and creating new opportunities and challenges for economic and social development. Many digital technologies have been around for a long time, but they are being introduced extensively nowadays, largely due to their increased functionality and decreased cost.

The number of Internet users over the past twenty years has rapidly increased, according to (ITU-T, 2022), in 2019 it exceeded 4,1 billion people, amounting to 53.6% the total population of the Earth (fig.1).

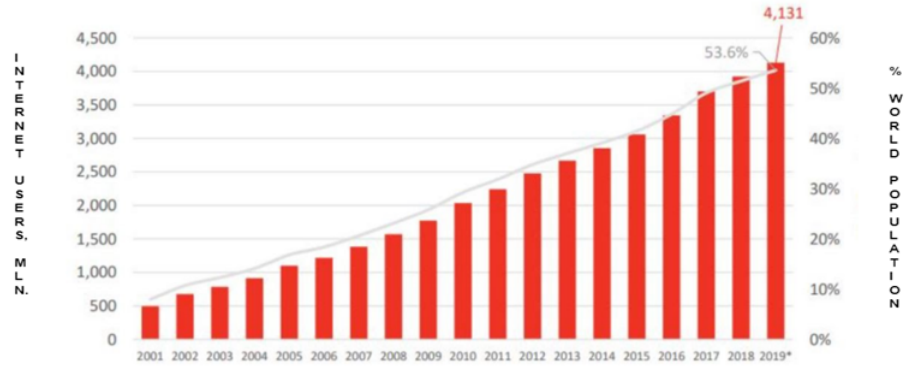


Fig. 1. Quantity of Internet users and their share in the Earth population

According to Accenture (Accenture, 2019), "...between 2009 and 2019, the cost of data processing decreased by 10%, costs - bridge of data transmission channels – by 40%, cost of sensors and measuring equipment – on 0.5%". Statistically, "the average cost per sensor in 2010 was 66 cents ($0.66), while it is projected for 2020, it will decrease further twice – up to 0.29 dollars" (Statista, 2023).

Such development leads to emergence of digital economy – "...internet-based digital technologies application to the production and trade of goods and services, which is becoming important part of the global economy" (UNCTAD, 2017). "The transition to a digital economy can provide a boost to competitiveness across all sectors, new opportunities for business and entrepreneurial activity, and new avenues for accessing overseas markets. It also provides new tools for tackling persistent development and social problems. However, it comes with a host of challenges – from the global digital divide to potential negative social and development impacts, and complex, internet-specific regulatory issues" (UNCTAD, 2017).

In order to survive in the digital economy, companies need to be transformed with digital technologies, but on the way of its digital transformation companies faces with critical challenges. The first challenge is to identify and define a path through all the different digital technologies that fits into the companies' business environment and capabilities. This path needs to be identified individually. Another challenges are integration with the existing IT systems, training of employees, and especially for small and medium sized enterprises (SMEs) limited resources.

Currently, there are a number of researches on companies digital transformation, provides an approaches to its planning and execution. Thus, the Hackett Group research has developed a holistic digital transformation framework specifically for business service functions (finance, human resources, procurement and information technology) as a basis for digital capability assessment and digital operating model design (fig.2) (Dorr, 2018).

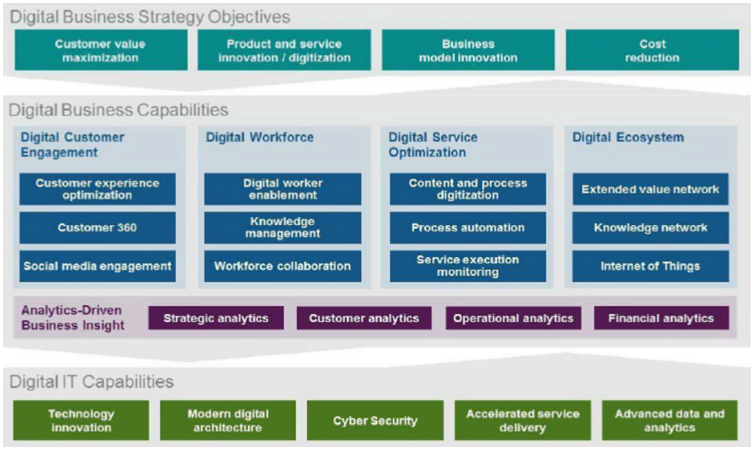


Fig. 2. The Hackett Group digital transformation framework (Dorr, 2018)

The framework's core capabilities relate to customer engagement, workforce, service optimization, ecosystem and business insight. The objective of the business services functions is to develop digital capabilities in each of this areas. The scope, depth and priorities of these capabilities could differ for the development of various digital business strategy, but ultimately all areas will be affected profoundly.

Other researchers propose to companies to develop a coherent change of capabilities. Thus, (Lankhorst et al., 2020) describes the imperative of coordination and harmonization of the change efforts across the disciplines involved. "...To this end, organizations invest in many disciplines that are concerned with change. These disciplines need to be coordinated and aligned, addressing:

1) Aim: Where do we want to go with the organization? What are the desired business outcomes? This is the domain of strategy management.

2) Analyze & Design: What are the elements of the enterprise in its context, how are they related, and how do they evolve? Here we find enterprise architecture and its sub-disciplines such as business and application architecture.

3) Realize: How do we move the enterprise in a desired direction, where do we invest? This is the world of portfolio management" (fig. 3).

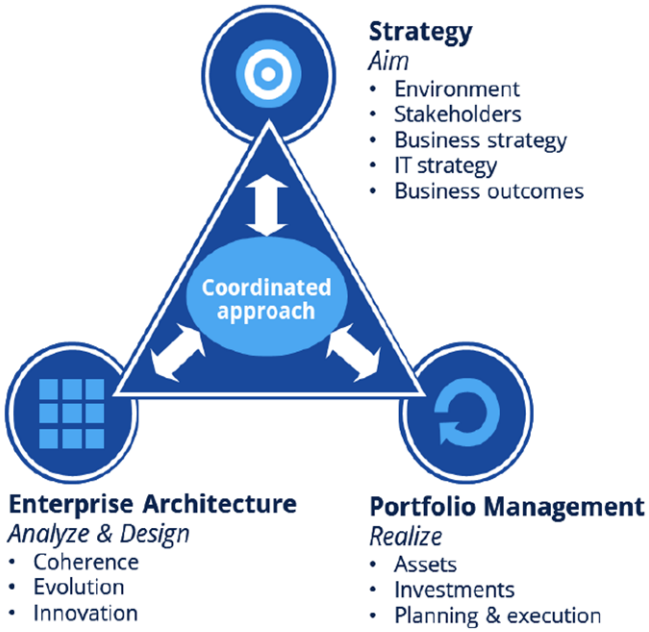


Fig. 3. The triangle between strategy, portfolio management and enterprise architecture (Lankhorst et al., 2020)

As authors had already pointed out before (Ilin et al., 2021), "...coordinated approach to the digital transformation could be provided by Enterprise Strategic Alignment Method (ESAM), based on researches results of the Twente University (Enschede, the Netherlands) and the BiZZdesign company (Enschede, the Netherlands). Scientists group represent cross-disciplinary approach business and IT-architecture alignment for the purpose of the company strategic objectives achievement. This method unites such disciplines as Strategic Management, Capability Based Planning, Enterprise Architecture and Project Management". ESAM have refined steps of digital strategy development into "...eleven phases: visioning process, business model, environmental analysis, strategic options, strategic choices, strategy elaborations, strategic measurements, implementation design, transformation planning, implementation governance, strategy evaluation. Each of these phases contains at least one strategy model" (Aldea, 2017) (fig.4).

Fig. 4. The phases of the Enterprise Strategic Alignment Method (Aldea, 2017)

ESAM provides substantial support for the digital strategy development, but for its successful implementation all metrics and models should be integrated into special IT tools, which are capable to provide information in real-time mode and reduce manual interventions into the process.

The aim of current research is to supplement an approaches to digital strategy elaboration and evaluation with particular set of tools and models, which helps companies overcome challenges during the process of their digital transformation.

Materials and Methods

The Enterprise Architecture approach is a concept of enterprise management actively developed by institutions and now widely applied in practice. Lankhorst gave the following definition to this concept: "...is a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise's organization structure, business processes, information systems, and infrastructure" (Lankhorst, 2013). Enterprise Architecture definition first appeared in the Zachman framework of enterprise architecture (Zachman, 2002) setting the direction for the next decades.

Currently, there are several well-known approaches to EA, according to research (Aldea, 2017), the most common are:

– TOGAF methodology, an enterprise architecture methodology developed by the international consortium The Open Group;

– Zachman methodology - the very first methodology described in the architectural approach;

– Gartner methodology - enterprise architecture methodology developed by Gartner consulting

company;

– FEAF methodology - enterprise architecture methodology developed for US government organizations;

– DoDAF, an enterprise architecture methodology developed for the US Department of Defense.

Current study uses the TOGAF (The Open Group, 2018a) and the Capability Driven Development approach (CDD), an approach to the enterprise capabilities development based on Enterprise Architecture technics (Stirna et al., 2012).

The TOGAF is open standard which provides a practical, industry-managed way of designing EA. "The TOGAF framework enables the creation of these multi-dimensional views and categorizes them to create specific domains that enable an enterprise to consider the wider scope of their enterprise and capabilities" (The Open Group, 2018a). The TOGAF framework initially was based on Technical Architecture Framework for Information Management (TAFIM), developed by the US Department of Defense (DoD). Since its first edition in 1995, the TOGAF standard was constantly developed by members of The Open Group consortium, enabling now important benefits for more effective and efficient digital transformation of the organizations.

CDD is a new methodology envisioned to enable solutions for the emerging challenges of digital enterprises. Currently, capability development requires the solid base of business and IT domains knowledge. CDD brings together and builds up knowledge in these areas, creating best practices platform for the enterprise capabilities development.

"The Business model is a high-level impression of how an organisation is structured. It describes how an organisation creates, delivers and captures value. There are a number of viable strategy techniques that can be used to support business modelling. One of the most popular ones is the Business Model Canvas, which could be used as a shared language for describing, visualizing, assessing and changing business models" (Osterwalder and Pigneur, 2010). Authors propose Business Model Canvas application for the purpose of current paper. To determine the key performance indicators which can be used to monitor strategy implementation and evaluate the result of the implementation Balanced Scorecard, proposed by Kaplan and Norton was used (Kaplan and Norton, 1992).

Results and Discussion

In accordance with the current researches, "...digital transformation is a transition to digital business, a comprehensive transformation of the company's activities, business processes, competencies and business models, maximizing the use of digital networks to improve competitiveness and value creation in the digital economy. As a rule, digital transformation leads to the emergence of new markets, new consumers, the creation of new business models" (i-SCOOP, 2020). As the digital transformation strategy development requires coherent approach addressing all aspects, authors suggest using framework, which could support this task (fig.5).

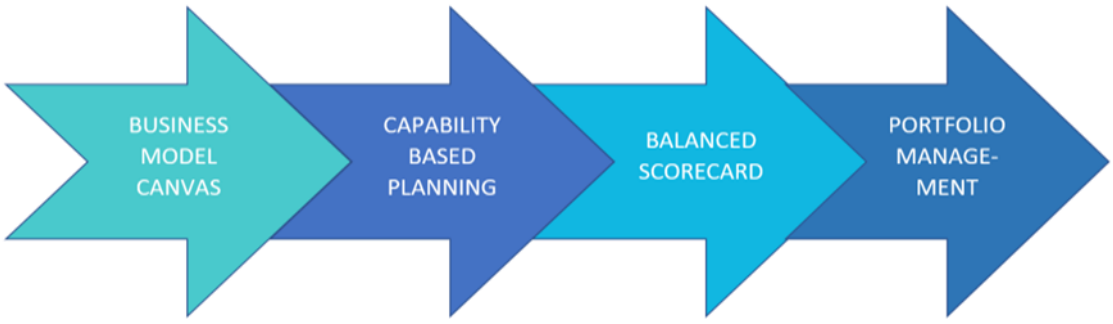
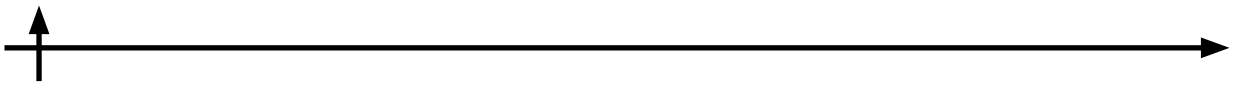


Fig. 5. Digital Transformation Strategy Development Framework



First of all, understanding of current business model and targeted one will help companies outline areas, which could be reshaped by company digital transformation. Among a number of developed business models, the most popular one is the Business Model Canvas, which describes nine building blocks, covering the main areas of company business, including customer segments, customer relationships, channels, key activities, key resources, value proposition, key partnerships, revenue streams, cost structure (Osterwalder and Pigneur, 2010). By block by block of the Business Model analysis, the company can draw conclusions about current business operations, customer structure and requirements, existing channels of interaction with customers and partners, and plan for the Business Model possible changes as a result of digital transformation. Such changes can include the following outcomes:

1. improved operational efficiency: streamlined processes, increased capital returns, supply chain alignment, extended employee involvement in work processes;

2. changing interactions with customers and partners (re-engineering of purchasing processes, improved customer service);

3. introducing a new business model (launching new products and services, generating new types of revenue, changing the product offering to customers).

Aspiration to change current business model is supported by motivation extension, "...which includes stakeholders, drivers, outcomes, goals, requirements, principles, risks and constrains" (Ilin et al., 2021). These motivation elements are described in the TOGAF standard and could be clarified as follows:

1. "stakeholder – an individual, team, organization, or class thereof, having an interest in a system;

2. driver – represents an external or internal factor that motivates an organisation to define its objectives and make the necessary changes to achieve them;

3. outcome – a final result of the digital transformation;

4. goal – a high-level statement of intent, direction or desired end state for the organisation or its stakeholders;

5. requirement – a necessity that defines a property of a particular application;

6. principle – a statement of intent defining a common property that applies to a system in a particular context;

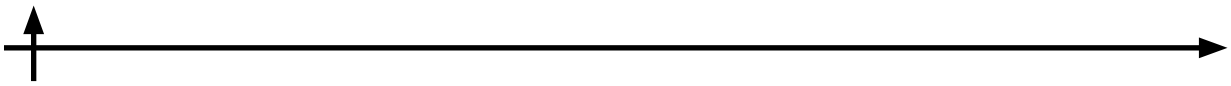
7. constrain – a factor limiting the goals realization" (The Open Group, 2018b).

There need to draw attention to the existing problem of different stakeholder groups with different concerns, specific views and often different positions and priorities. Capability driven approach can help focus the attention of different stakeholder groups on a joint objective more detailed than a business goal but still concrete enough to fit into their local view of what the responsibility is. This makes capability an integrative concept (Sandkuhl and Stirna, 2018).

Analyzing influence of digital transformation strategy implementation on business model blocks, there could be identified necessary strategic capabilities and strategic resources. Capability is a complex component meant to aggregate some established notions such as goal, process, resource, and context, to enable more efficient solutions in terms of congruence between business and technology. From an EA and IT perspective, capability-based planning is a powerful mechanism to ensure that the strategic business plan drives the enterprise from a top-down approach.

Capability thinking also means being aware of in what context the enterprise has the capacity and ability to offer business services that contribute to achieving business goals. "...Each capability supports or is motivated by one business goal. In principle business goals can be seen as internal means for designing and managing the organization and capabilities as offerings to external customers. A capability requires or is supported by specific business processes, provided by specific roles, as well as it needs certain resources and IS components. The distinguishing characteristic of the capability is that it is designed to be provided in a specific context. The desired goal fulfillment levels can be defined by using a set of goal fulfillment indicators – Goal KPIs" (Sandkuhl and Stirna, 2018).

As authors have pointed before (Maydanova et al., 2022), "...Balanced Scorecard (BSC) indicators



are perfectly approached for this task. Financial, Customer, Internal perspectives and Learning and Growth perspective will provide completed company model, indicators should be able to be recognized, measured, and presented in a coherent way".

Two main areas should keep in focus of the Balanced Scorecard for digital transformation: company value increase and stakeholders balance of interests.

Value-Based management theory accommodates necessary approach to company value measurement and governance. Currently, there are several models, developed for this purpose, which could be applicable. For Balanced Scorecard development it is necessary that model provides drivers, which influence company value. Such set of drivers could be developed for such company value models as Economic Value Added (Grant, 2002), Shareholder Value Added (Rappaport, 1997), Cash Value Added (Ottosson and Weissenrieder, 1998).

Company value drivers should correspond to principles as follows:

1. "Drivers" should be linked to value creation and have been brought to all levels of the organization;

2. Value drivers should be set as targets and measured using both financial and operational performance indicators;

3. Drivers should show both the current level of performance and long-term growth perspectives" (Ilin et al., 2021).

Another BSC area is stakeholders balance of interests. "Stakeholders of company digital transformation could be outlined as an individual, team, organization, or class thereof, having their interest in DT process and results; namely customers, partners, shareholders, specialists of different levels etc. As was mentioned before, different stakeholder groups with different concerns, specific views and often different positions and priorities. For BSC purpose stakeholders could be divided on external and internal ones. External stakeholders, drivers, goals and concerns need to be reflected in Customer perspective, and internal stakeholders ones – in Learning and Growth perspective".

Company digital transformation process requires IT-projects portfolio management capable to determine priorities, ensure the implementation and evaluate its results. That is why all BSC indicators and risks and constrains should be considered in enterprise architecture context and with their interrelation with enterprise architecture models. These reference models need to be created as for each pilot project, and for digital transformation strategy implementation phase as well. Thus, elements of digital transformation strategy are reflected on fig.6.

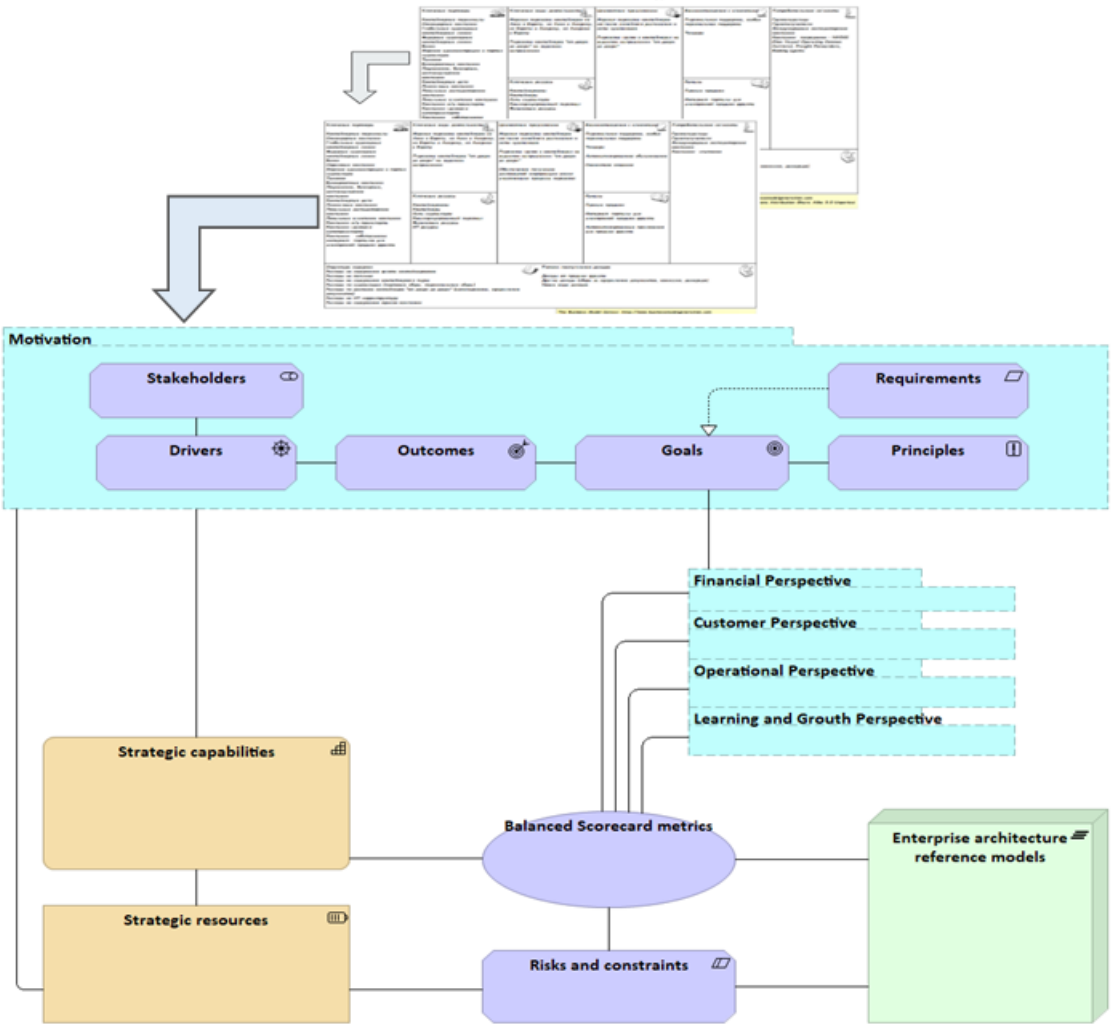


Fig. 6. Elements of digital transformation strategy

Digital transformation strategy implementation should provide strategic alignment company business and IT-architecture and strategic goals achievement in the most effective manner. To create company model for the purpose of digital transformation strategy development, it is needed to use ontologies.

Ontology (in computer science) is a tool for detalization and formalization a certain field of knowledge using a conceptual scheme. One of the main advantages of using ontology is the ability to combine information obtained from various information sources. For digital transformation strategy development authors propose an ontology as follows:

1. digital transformation domain (including business model, motivation, strategic capabilities, strategic resources);
2. BSC metrics;
3. risks and constrains;
4. EA reference models;
5. forecasting methods;
6. IT-projects.

Digital transformation is an ongoing process, and companies need to experiment and model their architecture on constant basis. The ontologies usage will allow companies to accumulate knowledge about implemented technologies and be able to make a prognosis of the digital transformation projects results.

Digital transformation requires a number of pilot IT-projects implementation, but companies fre-

quently limited with tools of its management and evaluation. For the purpose of IT-projects portfolio management authors propose to use intellectual system, represented on fig. 7.

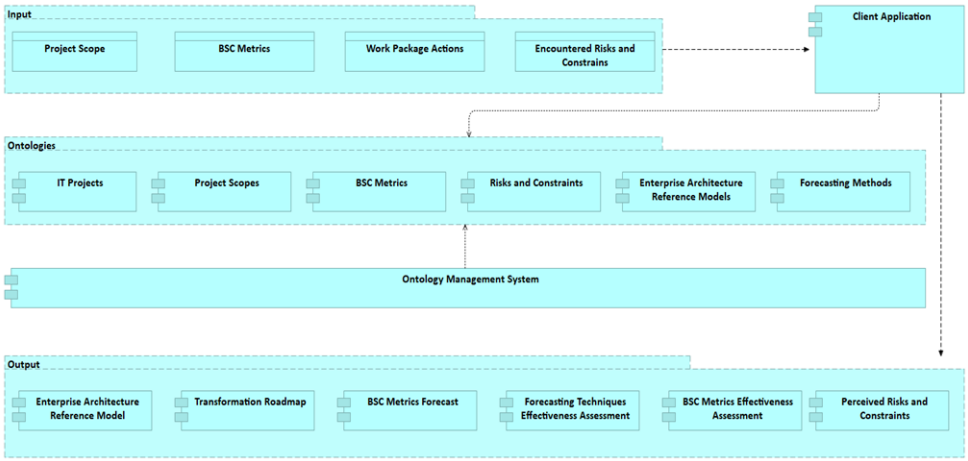


Fig. 7. IT-projects portfolio management system

As was mentioned before, companies on the way of its digital transformation companies face with critical challenges, and one of them is to define a path through different digital technologies that fits into the companies' business environment and capabilities. Intellectual system of IT-projects portfolio management provides possibility of IT-projects implementation knowledge acquisition and consists as a basic platform for company digital strategy development.

Thus, adoption of digital transformation development framework, models and IT-project portfolio management system, proposed in the current paper, will support companies transition to digital business models and comprehensive transformation of the company's activities, business processes, competencies.

Conclusions

Therefore, emergence of digital economy leads to substantial change of business environment and forces companies to change their activities, business processes, competencies and business models, maximizing the use of digital networks to improve competitiveness and value creation. Currently digital strategies are developed by a number of companies, but most of them face with absence of particular metrics and models for such development. Besides, digital strategy requires IT tools capable provide support for its development, implementation and evaluation. Suggested in current study digital strategy development framework, ontologies, and IT-projects portfolio management system have the potential to enable company digital transformation process on a new knowledge-based and technology-oriented level. It should be noted that the proposed coherent approach represents a digital transformation technology, as it offers a methodology and tools for modelling, and could provide valuable support for digital transformation strategy implementation.

REFERENCES

Accenture, 2019. Accenture Technology Vision 2019: Short Report.

Aldea A. 2017. Enterprise strategic alignment method : a cross-disciplinary capability-driven approach. Enschede, The Netherlands. DOI: https://doi.org/10.3990/1.9789036543309

Dorr E. 2018. A Framework for digital transformation of business services. URL https://www.linkedin.com/pulse/framework-digital-transformation-business-services

Grant J.L. 2002. Foundations of Economic Value Added, 2nd Edition, 2nd edition. ed. Wiley, Ho-

boken, NJ.

Ilin I., Maydanova S., Jahn C., Weigell J., Kersten W. 2021. Digital logistics as a perspective for the Northern Sea route. Chapters from the Proceedings of the Hamburg International Conference of Logistics (HICL) 32, 403–422.

i-SCOOP, 2020. What is digital business transformation? The essential guide to DX [WWW Document]. i-SCOOP. URL https://www.i-scoop.eu/digital-transformation/ (accessed 10.02.23).

ITU-T, 2022. World Telecommunication/ICT Indicators Database [WWW Document]. ITU. URL https://www.itu.int:443/en/ITU-D/Statistics/Pages/publications/wtid.aspx (accessed 11.03.23).

Kaplan R.S., Norton D.P. 1992. The Balanced Scorecard—Measures that Drive Performance. Harvard Business Review.

Lankhorst M. 2013. Enterprise Architecture at Work, The Enterprise Engineering Series. Springer, Berlin, Heidelberg. DOI: https://doi.org/10.1007/978-3-642-29651-2

Lankhorst M., Quartel D., Bodenstaff L. 2020. From strategy to successful implementation with enterprise portfolio management. URL www.bizzdesing.com/our-solutions

Maydanova S., Ilin I., Kersten W., Jahn C., Weigell J. 2022. Balanced Scorecard as the Basis for Global Container Shipping Line IT-Architecture Modeling, 548–555. DOI: https://doi.org/10.1007/978-3-030-81619-3_62

Osterwalder A., Pigneur Y. 2010. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, 1st edition. ed. John Wiley and Sons, Hoboken, NJ.

Ottosson E., Weissenrieder F. 1998. Cash Value Added - A New Method For Measuring Financial Performance. SSRN Journal. DOI: https://doi.org/10.2139/ssrn.58436

Rappaport A. 1997. Creating Shareholder Value: A Guide for Managers and Investors, Updated ed. edition. ed. Free Press, New York.

Sandkuhl K., Stirna, J. 2018. Capability Management in Digital Enterprises. Springer.

Statista, 2023. Worldwide - average sales price of sensors 2020 [WWW Document]. Statista. URL https://www.statista.com/statistics/736563/global-average-sales-price-of-smart-sensors/ (accessed 13.02.23).

Stirna J., Grabiss J., Henkel M., Zdravkovic J. 2012. Capability Driven Development – An Approach to Support Evolving Organizations, in: Sandkuhl, K., Seigerroth, U., Stirna, J. (Eds.), The Practice of Enterprise Modeling, Lecture Notes in Business Information Processing. Springer, Berlin, Heidelberg, 117–131. DOI: https://doi.org/10.1007/978-3-642-34549-4_9

The Open Group, 2018a. The TOGAF® Standard, Version 9.2 [WWW Document]. URL https://pubs.opengroup.org/architecture/togaf92-doc/arch/ (accessed 02.02.23).

The Open Group, 2018b. Motivation Elements : ArchiMate® 3.1 Specification [WWW Document]. The Open Group Publications Server. URL https://pubs.opengroup.org/architecture/archimate3-doc/chap06.html#_Toc10045334 (accessed 12.02.23).

UNCTAD, 2017. Investment and the digital economy. United Nations, New York and Geneva.

Zachman J. 2002. The Zachman framework for enterprise architecture.

СПИСОК ИСТОЧНИКОВ

Accenture, 2019. Accenture Technology Vision 2019: Short Report.

Aldea A. 2017. Enterprise strategic alignment method : a cross-disciplinary capability-driven approach. Enschede, The Netherlands. DOI: https://doi.org/10.3990/1.9789036543309

Dorr E. 2018. A Framework for digital transformation of business services. URL https://www.linkedin.com/pulse/framework-digital-transformation-business-services

Grant J.L. 2002. Foundations of Economic Value Added, 2nd Edition, 2nd edition. ed. Wiley, Hoboken, NJ.

Ilin I., Maydanova S., Jahn C., Weigell J., Kersten W. 2021. Digital logistics as a perspective for the Northern Sea route. Chapters from the Proceedings of the Hamburg International Conference of Logistics (HICL) 32, 403–422.

i-SCOOP, 2020. What is digital business transformation? The essential guide to DX [WWW Document]. i-SCOOP. URL https://www.i-scoop.eu/digital-transformation/ (accessed 10.02.23).

ITU-T, 2022. World Telecommunication/ICT Indicators Database [WWW Document]. ITU. URL

https://www.itu.int:443/en/ITU-D/Statistics/Pages/publications/wtid.aspx (accessed 11.03.23).

Kaplan R.S., Norton D.P. 1992. The Balanced Scorecard—Measures that Drive Performance. Harvard Business Review.

Lankhorst M. 2013. Enterprise Architecture at Work, The Enterprise Engineering Series. Springer, Berlin, Heidelberg. DOI: https://doi.org/10.1007/978-3-642-29651-2

Lankhorst M., Quartel D., Bodenstaff L. 2020. From strategy to successful implementation with enterprise portfolio management. URL www.bizzdesing.com/our-solutions

Maydanova S., Ilin I., Kersten W., Jahn C., Weigell J. 2022. Balanced Scorecard as the Basis for Global Container Shipping Line IT-Architecture Modeling, 548–555. DOI: https://doi.org/10.1007/978-3-030-81619-3_62

Osterwalder A., Pigneur Y. 2010. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, 1st edition. ed. John Wiley and Sons, Hoboken, NJ.

Ottosson E., Weissenrieder F. 1998. Cash Value Added - A New Method For Measuring Financial Performance. SSRN Journal. DOI: https://doi.org/10.2139/ssrn.58436

Rappaport A. 1997. Creating Shareholder Value: A Guide for Managers and Investors, Updated ed. edition. ed. Free Press, New York.

Sandkuhl K., Stirna, J. 2018. Capability Management in Digital Enterprises. Springer.

Statista, 2023. Worldwide - average sales price of sensors 2020 [WWW Document]. Statista. URL https://www.statista.com/statistics/736563/global-average-sales-price-of-smart-sensors/ (accessed 13.02.23).

Stirna J., Grabiss J., Henkel M., Zdravkovic J. 2012. Capability Driven Development – An Approach to Support Evolving Organizations, in: Sandkuhl, K., Seigerroth, U., Stirna, J. (Eds.), The Practice of Enterprise Modeling, Lecture Notes in Business Information Processing. Springer, Berlin, Heidelberg, 117–131. DOI: https://doi.org/10.1007/978-3-642-34549-4_9

The Open Group, 2018a. The TOGAF® Standard, Version 9.2 [WWW Document]. URL https://pubs.opengroup.org/architecture/togaf92-doc/arch/ (accessed 02.02.23).

The Open Group, 2018b. Motivation Elements : ArchiMate® 3.1 Specification [WWW Document]. The Open Group Publications Server. URL https://pubs.opengroup.org/architecture/archimate3-doc/chap06.html#_Toc10045334 (accessed 12.02.23).

UNCTAD, 2017. Investment and the digital economy. United Nations, New York and Geneva.

Zachman J. 2002. The Zachman framework for enterprise architecture.

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