

Challenges in Integrating a Virtual Project Office: a Survey of High-tech Enterprises in the Republic of Bulgaria

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Abstract—The publication deals with a current problem related to the challenges of integrating a virtual project office into the business activities of high-tech enterprises in the IT industry in the Republic of Bulgaria. Multi-layered emphasis has been placed, which is applied in a practical study, so as to establish the role of technology and the human factors in a digitalizing project environment. The survey emphasizes the opportunities for integrating a virtual project office, by studying a certain number of small and medium-sized high-tech enterprises in order to establish the main challenges. A survey has been conducted and an expert assessment method has been applied, through which empirical data has been generated in the business of small and medium-sized high-tech enterprises in the IT industry. Complex challenges and some management problems have been identified that affect the project activities of the studied enterprises in the integration of a virtual project office.

Keywords—Virtual project office, high-tech enterprises, IT industry, projects in a digital environment.

I. INTRODUCTION

Today, modern companies operate in a relatively unpredictable business environment when changing the business model from conventional to digital. This has forced a significant number of companies to digitize corporate activities so as to adapt to environmental factors, building strategic partnerships for joint initiatives and projects. In the context of digitization and adaptation of the business model to digital technologies and management systems, companies are faced with challenges in business process management. Automation is increasingly used in various project initiatives, and success will depend not only on the impact of environmental factors, but also on the level to which project activities are digitized. Key importance is given to the virtual project office for project

management, since in the context of digitalization, the focus of corporate activities changes.

The integration of a virtual project office is a priority for companies to adapt to the digital transformation of business, implementation of strategic initiatives, work of the human factors in a digital environment, building project relationships with stakeholders, selection of technological infrastructure, achieving key performance indicators and project portfolio management.

This requires taking into account some challenges that play a significant role in designing a virtual project office for project management in the companies' business. With the digitalization of the virtual project office, the project activity is based on a cloud or digital platform that helps the project team work remotely, optimize project processes and share resources in an online environment. This is done through modern IT technologies and software tools for work and cooperation of the human factors in project management in a virtual environment.

With the development of digital technologies and the transition to an online working mode or a hybrid organizational environment, the requirements for the design and successful integration of project activities and processes have also changed. Working in a digital environment is not new for companies that develop international project activities, but this aspect of the organization and management of project initiatives has acquired other dimensions with the emergence and spread of the coronavirus disease.

One of the essential aspects of implementing projects in a digital environment is related to the successful

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integration of a virtual project office, so as to synchronize the work of people in the project digitalization system and to use appropriate IT technologies and software solutions. In the scientific literature and practice of digitalization of project activity, significant importance is given to the role, functionality and working approach of the virtual project office. The emphasis is placed on two interrelated activities that determine the key indicators in the process of planning and implementing the virtual project office. These challenges are becoming the subject of scientific interest and the search for good practices under the general name of virtual project office integration [1], [2], [3].

The main challenges regarding the purpose of the virtual project office arise from the digital transformation of business and the shift in focus to IT technologies, virtual teams and software tools [4], [5], [6], [7]. Some authors prioritize issues related to vision, mission and goal setting in the digital transformation of project activities [8], [9], [10].

The main focus when defining the vision for designing a virtual project office is the choice of a methodology for working in a digital environment, through the application of modern technological tools for coordinating project activities. The emphasis when defining the mission for designing a virtual project office is achieving digital leadership in coordinating corporate initiatives in terms of strategic priorities and business goals, resources and time for implementing project initiatives. When it comes to goal setting, the virtual project office must implement project goals and priorities with optimal use of resources for coordinating the companies' project initiatives.

Other authors consider the challenges in determining the scope and functionality of the virtual project office [11], [12], [13], [14]. The priority areas are related to business processes in a digital environment and key performance indicators. From the perspective of business processes, the strategic aspects of ensuring effective interaction between business process management, synchronization of cooperation between performers and the effectiveness of results are studied. The main IT business processes and software solutions related to IT technologies in the project office, cloud infrastructure, business process automation, software products used, automated analysis of project data and opportunities for integrating AI are monitored. The business processes for managing project technology in the digitalization of the office are studied, regarding technological activities in project initiatives, technological integration and implementation of project processes, monitoring and optimization of technological infrastructure and technological support systems. Business processes in the project portfolio are a specific tool in the digitalization of the work of the project office and require synchronization with the strategic priorities of the companies in order to achieve the planned goals. The challenges associated with structuring digital project activities in relation to

workflows and procedures for performing tasks, key business processes in the project portfolio (portfolio strategy, portfolio resources, portfolio methodology, etc.), portfolio risk, the project portfolio management framework, decision-making for managing portfolio processes, etc. are taken into account.

One of the most important aspects in studying the challenges in the activity of the virtual project office is related to key performance indicators. Authors [15], [16], [17], [18] [19], [20] direct their attention to various areas for determining the effectiveness of the work of the virtual project office and the digitalization of project activity. From the perspective of strategic activities in a virtual project environment, attention is focused on priorities that relate to communication aspects for proper interaction between participants in a digital environment, the role of technological infrastructure and the possibility of adapting modern achievements in digital project activity. The effectiveness of the work of the human factors in the virtual project office is also examined as a key priority for optimal indicators of the digitalization of the project office. The knowledge of team participants about the project initiatives in the office and the trust that is built during teamwork in a project digital environment are important. The effectiveness of the use of information technologies for work in the virtual project office is also a key indicator of effectiveness, therefore various factors are taken into account to establish the degree of their usefulness.

In this regard, the extent to which business processes and tasks are automated is taken into account, to what extent IT technologies reduce company costs, do they help reduce human errors and omissions in work, to what extent is the work in the project office digitized and what is the ratio of digital to physical infrastructure in project activity, how the data necessary for the work of the virtual project office is generated, what is the level of cybersecurity, etc. In the work of the virtual project office, metrics are important that determine the extent to which progress has been achieved in the work of the office members and the effectiveness of the coordination of project activities and processes. Importance is given to the degree of fulfillment of the tasks of the virtual project office, monitoring the effectiveness of progress and achieved results, team commitment, improving administrative and decision-making in the field of IT technologies, studying working time that does not lead to added value, etc.

Naturally, a very important indicator of digital project activity in the office is the return on investment in the human factor and technological infrastructure. The return on investment from designing a virtual project office is determined in accordance with the optimization of project activity and resources used, cost reduction and efficiency increase.

According to authors [21], [22], [23], regulating the effective operation of the virtual project office requires defining challenges in forming the management structure, which is not an easy task in a virtual environment and should not be underestimated. Unlike the traditional (conventional) project office, the hierarchical share of management bodies is reduced, which can be under the auspices of a responsible person (leader), who in a digital environment can synchronize the work of internal and external stakeholders. For a significant number of companies, the challenge is structuring the requirements for the leader's work, his powers and his interaction in a virtual environment.

Some challenges of the virtual project office are related to the participation of stakeholders in the companies' projects, which requires their categorization and involvement in project initiatives. It is necessary to determine the types of stakeholders who, when digitizing business processes, have different initiatives and contribute to the success of project activities. Differentiating stakeholders requires dividing them into internal and external, by distinguishing their position in digital projects. In order for the coordination of the latter to be successful, the processes in the virtual project office are automated according to the direct or indirect participation of the parties, their commitment to the project processes and their investment behavior.

The analysis of stakeholders aims to establish which of them have a significant influence on digital projects and what their interests, goals, values, motives and intentions are. This will help the virtual project office team to actively manage project initiatives and better coordinate their participation in digital projects, developing a plan for communication and sharing feedback on the results.

Authors believe [24], [25], [26] that the challenges associated with the standards for the work of the virtual project office in coordinating digital projects of companies are reduced to standards for good management practices, for the implementation of project goals and objectives, for the work of the human factor, the selection and application of software tools, resource provision and budgeting, risk management, monitoring and reporting of results. Some challenges in managing the project portfolio of companies from the virtual project office are related to the coordination of projects in the digital transformation of business. The trend has become established as a catalyst not only for the accelerated digitalization of business processes, but also the search for effective solutions for projects in a digital environment in terms of resources, time and satisfaction of stakeholders.

The challenges in managing the project portfolio of companies are related to the overall coordination of initiatives in terms of strategic business goals and their achievement. For example, in the digital transformation of the business of companies, projects have different business

goals synchronized in a common process, so that digitalization meets the needs of customers, integrates the portfolio of project goals, satisfies the interests of stakeholders, optimizes costs and resources for their achievement.

Since digitalization in the virtual project office has a key role in managing the project portfolio of companies for coordinating projects, a significant challenge is software assurance in the conditions of cloud architectures and digital business technologies [27], [28] Most providers of software services for project portfolio management offer tools such as SPM and APMR with a tendency for compatibility. Thus, the choice of software tools for project portfolio management by the virtual project office is a prerequisite for good coordination of strategic project priorities with possible options for an appropriate software platform. A challenge for the top management of companies is to identify the management problems that limit or hinder the work of the virtual project office.

II. MATERIALS AND METHODS

The main objective of the publication is to identify, from a group of respondents, experts in high-tech enterprises from the IT industry in the Republic of Bulgaria, the challenges of integrating a virtual project office for work in a digital project environment. The respondents are different categories of experts (project managers and coordinators, Scrum masters, software developers, IT specialists, data analysts and cybersecurity specialists), who participate in different roles in the activities of the virtual project office.

The study was conducted on the territory of the city of Sofia, the capital of the Republic of Bulgaria, where a significant number of IT enterprises are concentrated. 32 small and medium-sized companies from the IT sector were studied, and the authors do not claim to national representativeness of the sample, since a certain number of enterprises in the sector were studied. The surveyed enterprises in the IT sector are divided into two groups: 1) hardware and software development manufacturers (manufacturing computers, servers, network devices and IT hardware) and 2) cloud computing providers (offering cloud infrastructure, platform and software services), IT services and consulting (offering IT support, services and business consulting).

The publication presents the results of a preliminary study, which aims to identify one of the aspects related to the challenges facing high-tech enterprises in the IT industry in the Republic of Bulgaria in the integration of a virtual project office. The study was conducted for scientific purposes, which are part of the scientific and research activities of the authors in the field of project management and the adaptation of good practices in Bulgarian business environment conditions. The conducted study shows a certain trend regarding the challenges facing high-tech enterprises in the IT industry

in the Republic of Bulgaria in the integration of a virtual project office and is sufficient in scope to gain an idea of the studied processes.

A study was conducted and an expert assessment method was applied, and a survey was compiled to collect data from respondents at an interval of 49 days during the months of November and December 2024. The survey was sent to 45 small and medium-sized IT enterprises at random and was completed only by experts with different roles in the activities of the virtual project office. The completed and returned surveys were 117, to experts representing 32 small and medium-sized high-tech enterprises from the IT industry, due to the refusal of 13 enterprises to cooperate with the study. The completion of the questionnaire and the provision of information is with the voluntary consent of the respondents, and the requirements for confidentiality and ethics of the study were met, and the information obtained was used only in the form of a sociological sample for the purposes of the publication. The study did not set age restrictions and gender division of the surveyed specialists, but sought a comprehensive answer to the challenges of integrating a virtual project office for work in a digital project environment.

The results were obtained by allowing respondents to give more than one possible answer to each question in order to cover the main aspects related to the challenges of integrating a virtual project office for working in a digital project environment. The survey was conducted by structuring five questions so that respondents could share their perceptions and attitudes regarding the challenges of integrating a virtual project office.

III. RESULTS AND DISCUSSION

The results of the study are presented in the following figures. For all questions, respondents have the opportunity to indicate more than one answer.

As can be seen from the figure 1, it is clear that technology and software tools play a crucial role in project management in a virtual environment. Of 117 experts surveyed, 101 of them indicated the answer - "IT business processes and software solutions". In turn, this includes the use of various project management platforms, cybersecurity and data protection, etc.

In second and third place, respondents indicated – "Business processes in the portfolio of digital project activities" (97 respondents) and "Business processes for managing virtual project activities" (74 respondents). This fact is not accidental. The integration of various project activities within the overall portfolio is of utmost importance, which in turn poses challenges for project managers such as synchronizing multiple virtual projects, the need for optimal allocation of resources between different projects, measuring efficiency and results in a digital environment, etc. All this corresponds to the main

management aspects of virtual projects - communication and coordination within the team and between distributed teams, monitoring and control of work processes. Widespread flexible project management methodologies - using Agile, Scrum, Kanban, etc. - come to the rescue here.

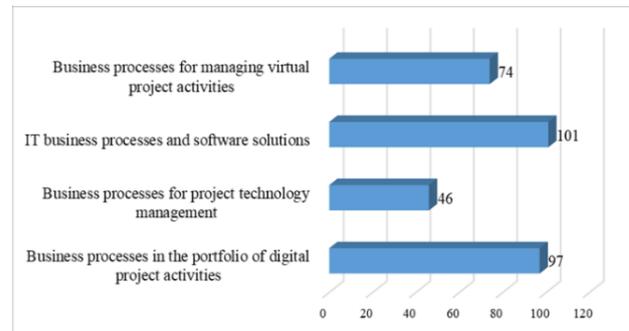


Fig. 1. Answer to the question: „What do you think are the challenges associated with project activities in a virtual environment?“

The last fourth place according to the respondents is occupied by the answer "Business processes for project technology management" (46 respondents). This means that although technologies are important (especially when we are talking about virtual project meetings, virtual project office), they are considered as part of a larger process / project, and not as a leading factor. In this regard, project managers need to make a choice of appropriate technological tools, tailored to the specifics of the specific project, integrating new technologies into existing business processes, etc.

Other key challenges faced by small and medium-sized high-tech enterprises are those related to key performance indicators in the virtual project office (Fig. 2).

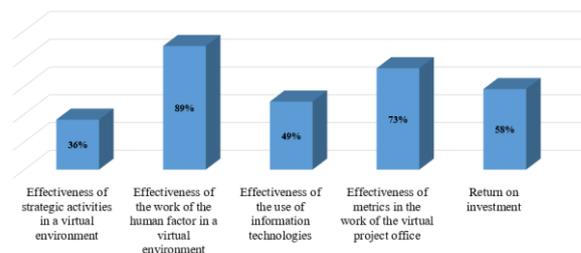


Fig. 2. Answer to the question: What are the challenges associated with key performance indicators in the virtual project office?“

As can be seen from Figure 2, according to the surveyed experts, the highest percentage is occupied by the efficiency of the work of the human factors in a virtual environment (89%), which is related to communication barriers, difficulties in coordination, lack of physical presence, lack of commitment. This in turn requires the determination of the correct, key indicators of efficiency in the work of the virtual project office (73%). New approaches are needed to measure the performance of individual project team members, which can lead to management difficulties.

Return on investment ranks third (58%), as virtual projects often require investments in technology, training, and adaptation of human resources to integrated processes and technologies, which do not always pay off in a short time.

In addition to the challenges faced by small and medium-sized high-tech enterprises related to the activities of projects in a virtual environment, the authors are also interested in the good management practices of organizations in this area.

This is shown in the following figure (Fig. 3), which reflects the results of the question "What are the good management practices in the activities of the virtual project office?".

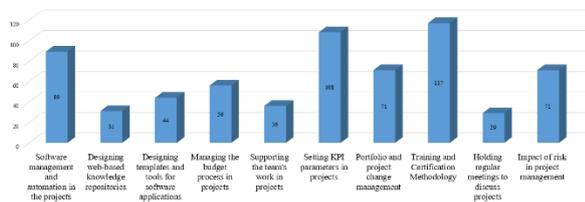


Fig. 3. Answer to the question: "What are the good management practices in the operation of the virtual project office?"

Good management practices in the operation of the virtual project office focus on training and certification methodology (117 respondents), setting the parameters for measuring efficiency through KPI (108 respondents) and software management and automation in projects (89 respondents). Employee training is a key factor for successful project management and, accordingly, work in a virtual project office. As it became clear, this includes not only the acquisition / possession of technical skills, but also knowledge in the field of agile project management methodologies (Agile, Scrum and PMP (Project Management Professional) certifications).

Along with having this knowledge, another good management practice is to clearly define KPI parameters for monitoring and evaluating the performance of the project team. One way to improve the efficiency of the virtual project office is software management and automation. The organizations studied indicate this management practice, which occupies third place. It is through automation that productivity is increased and errors are reduced, facilitating the work of project teams. However, all this, in turn, requires good integration with existing systems and teams.

In fourth position are two of the possible answers, namely: "Portfolio and project change management" and "Impact of risk in project management" – 71 respondents. They represent significant management practices for the surveyed organizations. In order to be competitive, especially operating in a dynamic environment, in the era of technology, high-tech enterprises must proactively identify and manage risks to minimize losses, proper /

flexible project management and adaptation to changes are critical for the success of the virtual office.

The last two positions of this question are occupied by the answers "Holding regular meetings to discuss projects" (29 respondents) and "Designing web-based knowledge repositories" (31 respondents). Regular meetings are useful because they provide transparency and efficiency, but they should be planned with such a frequency that they do not reduce productivity (if they are held too often). Regarding web repositories - they are a useful tool in managing a virtual project office, but nevertheless they are in one of the last places of the good management practices listed. This arises from the fact that they require maintenance, security and up-to-date content, although they allow easy access to information.

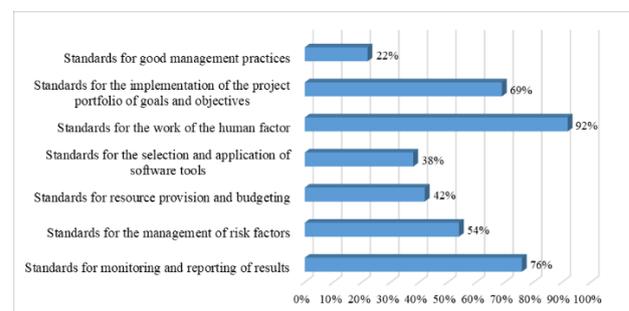


Fig. 4. Answer to the question: „What are the challenges in setting standards for the operation of the virtual project office?“.

The results, visible in Figure 4, confirm that managing people in a virtual environment is the biggest challenge. 92% of respondents indicated the answer "Human Factors Work Standards". In addition to the difficulties in communication and synchronization of tasks, which also stood out in other questions, the lack of motivation and commitment in remote work, cultural differences and work habits of team members and between individual project teams, are some of the possible reasons for this.

This somewhat leads to other consequences, namely tracking work and efficiency in a virtual environment, which is complex and makes it difficult for organizations to define clear KPIs, measure productivity and evaluate results. 76% of respondents indicated the answer "Standards for monitoring and reporting results".

The high percentage of the answer "Standards for the implementation of the project portfolio of goals and objectives" (69%) indicates that the implementation of standards for managing multiple projects is difficult in a virtual environment and, if there is no clear strategy and control tools, can lead to inconsistencies and low efficiency.

The lowest percentage of this question is the answer "Standards for good management practices" (22%), indicating that organizations largely have established management practices, however, they encounter

difficulties and problems with their implementation in specific situations.

The integration of a virtual project office in high-tech enterprises is accompanied by a number of management challenges that require careful planning and adaptation to the dynamic environment they operate in. Although virtual offices offer significant advantages – flexibility, easy access to various resources, cost reduction, their implementation often encounters a number of difficulties and problems.

Virtual project offices require well-defined processes that ensure task traceability and transparency, a well-established technological infrastructure, and protection of sensitive information, which is becoming increasingly complex, especially between several project teams.

In the survey, respondents were able to identify key management issues that hinder the integration of a virtual project office. In Table 1, these issues are examined separately for the two groups of high-tech enterprises. The authors' goal is to investigate whether there is a difference, and if so, what it is. To see which of the issues are perceived as critical for the organizations surveyed.

TABLE 1 MANAGEMENT ISSUES HINDERING THE INTEGRATION OF A VIRTUAL PROJECT OFFICE

Management issues hindering the integration of a virtual project office	Researched enterprise groups	
	Hardware and software development manufacturers (manufacturing of computers, servers, network devices and IT hardware)	Cloud computing providers, IT services and consulting, IT support, services and business consulting
Lack of appropriate methodology for working in a digital environment	68%	53%
Lack of resource provision for working in a digital environment	51%	81%
Lack of rational distribution of roles and tasks of the human factor	70%	65%
Lack of appropriate tools for coordinating projects in a digital environment	28%	76%
Lack of digital organizational culture	89%	38%
Inappropriate business model for digital transformation	45%	24%

For hardware and software manufacturers, the most serious problem, according to respondents, is the lack of a digital organizational culture (89%). Despite the

availability of technologies and resources, there is still a lack of so-called digital thinking and a culture of teamwork in a virtual environment. One of the tools for dealing with such a problem is conducting more training on the digital transformation, which is already a fact in all spheres of activity, creating new communication strategies, stimulating proactivity for working in a digital environment, etc.

In the second group of surveyed high-tech enterprises, this problem is significantly less pronounced (38%). This fact is not accidental, since these companies have more experience working in a digital environment and their employees are more adapted to virtual working conditions. However, they still perceive this as a challenge, since the digital transformation is not yet fully completed. These organizations must continue to work in this direction by upgrading their digital culture, through training in managing virtual teams, digital leadership, etc.

For hardware and software development manufacturers, the second and third place among the management problems hindering the integration of a virtual project office are "Lack of rational distribution of roles and tasks of the human factor" (70%) and "Lack of appropriate methodology for working in a digital environment" (68%), respectively.

For cloud computing, IT services and consulting providers, these places are occupied, respectively, by "Lack of appropriate tools for coordinating projects in a digital environment" (76%) and "Lack of rational distribution of roles and tasks of the human factor" (65%).

In the second and third places mentioned above, one of the problems of both groups of enterprises is approaching, namely "Lack of rational distribution of roles and tasks of the human factor". Providers of cloud computing, IT services and consultations often work in so-called cross-functional teams that require daily coordination. Poor distribution of roles and tasks of the human factors in both groups of high-tech enterprises can lead to failure to complete the project on time, inefficiency, gaps in work, lack of commitment. One way to deal with such problems is to implement various digital tools for managing teams in a virtual environment, use platforms for distributing and managing tasks, etc.

The last places of management problems for both groups of enterprises are occupied by "Lack of appropriate tools for coordinating projects in a digital environment" (28%) for manufacturers of hardware and software developments and "Inappropriate business model for digital transformation" (24%) for providers of cloud computing, IT services and consulting, IT support, services and business consulting.

The low percentage (28%) of the lack of appropriate tools for coordinating projects in a digital environment shows that enterprises have a certain base of technological

solutions and tools, but still require optimization and integration of different platforms for joint work.

Similarly, for cloud computing, IT services and consulting providers, the least pronounced problem is "Inappropriate business model for digital transformation" (24%). They, like other enterprises, must also continue to develop innovative services that optimize the business models used so far for digital transformation.

The successful integration of a virtual project office depends not only on technology, but also on effective leadership, clear communication and building trust among team members.

IV. CONCLUSIONS

The digital transformation of business activity has imposed a new model for managing project activity. In addition to the role of the human factor in an environment of digitalization of project activity in the virtual office, it has an impact on the business of companies whose orientation is focused not only on internal business processes. The integration of a virtual project office creates conditions for the formation of potential strategic partnerships, both with external and internal stakeholders. It is necessary to create appropriate conditions for rethinking the organizational culture in a virtual project environment, primarily by changing the internal business orientation of the project office towards strategic coordination of projects in a virtual environment, i.e. to take into account the horizontal aspect of external integration.

The integration of a virtual project office creates conditions to improve the project process by engaging contractors and subcontractors in their involvement in decision-making, regardless of geographical location.

A virtual project office is a useful tool for working on projects in a virtual environment, as it sets the standards for managing project initiatives and improves communication between stakeholders. It reduces redundant processes and reduces management costs, shortens bureaucratic procedures, creating the necessary prerequisites to coordinate large and complex projects. Despite the flexible structure and the benefits of creating a virtual project office for project management, some challenges arise for companies that senior management should consider when integrating it into a virtual environment.

As a result of the publication, the following main contributions have been achieved:

- Based on a study of the scientific literature on the problem, some challenges and specific characteristics in integrating a virtual project office have been identified.
- The study identified the main challenges of a certain sample of respondents (small and

medium-sized high-tech IT enterprises in the Republic of Bulgaria) regarding the integration of a virtual project office in business activities and in particular when implementing projects in a digital environment. In summary, it can be said that the surveyed companies perceive different types of challenges, which cover specific categories in the field of human factors, technologies and specific project activities.

- The study conducted to identify the main challenges of a certain sample of respondents (small and medium-sized high-tech IT enterprises in the Republic of Bulgaria) regarding the integration of a virtual project office is a prerequisite for generating information about the main problems and good practices in the digitalization of project activities. The generated data can be used to compare trends in future research in the relevant field and to establish the development of processes in digital business transformation and the level of progress achieved in the field of integrating a virtual project office into the business of high-tech enterprises from the IT sector in the Republic of Bulgaria.

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