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**Efficiency of project
management in higher
education establishments
on the example of Gdynia
Maritime University**

1. Introduction

In the available source literature, the authors indicate the complexity of issues related to measuring the efficiency in Higher Education Establishments (HEE) relative to their specific features, e.g., they are not business entities, which makes them not profit-oriented, they conduct activities where the effects are difficult to measure, and they are also influenced by various stakeholders. Not all HEE results implemented by the academic community are easy to measure and quantify. However, it does not mean that we should refrain from measuring their efficiency. The contemporary social and economic environment is subject to constant and dynamic changes, which also significantly translates into actions taken by decision-makers at HEE aimed to adapt to the needs of a broad group of stakeholders.

The observed increase in the number of projects implemented by universities results in posing a question on the level of performance regarding such projects. Regular monitoring

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of the efficiency of project management allows the HEE authorities to make the right decisions and, thus, achieve their goals. As a result, understanding the importance of efficiency, its measurement methods and performance indicators should be crucial for the HEE authorities. Therefore, this study aims to assess the project management performance indicators in higher education establishments on the example of four deliberately selected projects carried out at the Gdynia Maritime University (UMG). In the studies, the method of research in action was applied as well as the method of direct interview. The analysis covered the selected projects implemented at UMG in Gdynia between 2017 and 2021. Moreover, the following research questions were formulated: Which indicators are used to assess the efficiency of project management at HEE?, 2) Does the surveyed HEE analyse the project management efficiency assessment?

In addition, the following research hypotheses have been developed: H_1 : The higher the efficiency of task implementation within projects, the smaller the number of departments in the organizational unit involved in implementing these tasks; H_2 : The efficiency of the implementation of project financial plans developed at universities is high and amounts to 100% and H_3 : The project management team of projects implemented at HEE, when delegated to work on a given project, are assigned an insufficient number of hours.

In order to conduct the study, the Author's indicators were proposed to assess the efficiency of process management during the implementation of projects in HEE and these were applied in the analysis presented in the article.

The authors are aware that the obtained results and conclusions regarding the questions and research hypotheses should be interpreted very carefully and relate them only to the university under study and the projects selected for the analysis.

2. Theoretical considerations on the efficiency of project management

The literature query indicates multiple definitions of project management. J. Davidson Frame indicates that "project management comes down to possibly most efficient project implementation in terms of time, cost (as well as resources that can be obtained within a certain budget) and technical requirements". (Davidson Frame, 2001). M. Trocki defines project management as "a set of managerial activities related to project implementation and a set of principles, methods and means used to that end" (Trocki et al., 2003). H. Kerzner describes project management as "a project aimed to achieve the set objective, requiring the use of resources, within the time, cost and quality constraints [...]" (2005).

Z. Pawlak, in turn, believes that it is “a process of controlling and applying available knowledge, skills, tools and techniques to meet the expectations of project stakeholders. In this process, the project manager should strive to use indispensable human, material, financial and information resources effectively to achieve the goal” (Pawlak, 2011). Thus, project management is a process aimed to ensure the project implementation pursuant to a defined goal and scope, planned budget, on time, and with the use of appropriate resources, methods and means, so that this action is effective.

The following methodological aspects are the prerequisites for efficient project management: managerial skills and project manager competences, project management methodology, introduction to project management, employee training and skill improvement and selection of team members. The social and cultural criteria to be met include effective motivation of the team to participate in projects, efficient communication between organizational units and teams, including interdisciplinary ones, involved in their implementation and the ability to work in a team (Prussak, Wyrwicka, 1997).

Analysis of the literature on the subject made by the authors indicates that the effectiveness of the activities at university is analyzed and evaluated from various points of views, i.e.: at the international level by comparing the effectiveness of universities in various countries (Wolszczak-Derlacz, 2018), at national level (Alkhaldi & Gadhoum, 2017), and in detail at the level of individual departments (Kim & Kim, 2020).

The effectiveness of universities is also a subject of research from the perspective of the area of interest. Researchers attempt to analyze and develop i.e. the effectiveness of the university’s didactic activity both in terms of numbers of graduates as well as the quality of education in the context of the labor market, taking into account the value of graduates’ earnings after completing academic education (Brzezicki, 2020). Others attempt to develop a concept for effective project management related to computerization on learning (Stańczak et. al., 2016). When working on this research, different policymakers use different forms of performance measurement.

As A. Grycuk notes the advantage of KPIs is, i.e. ongoing analysis of achieved results, the possibility of using the obtained information in strategic planning, transparency of processes and involvement of all employees (Grycuk, 2010). This means that despite the authors’ awareness that efficiency is a term understood in many ways, attempts should be made to analyze and evaluate universities using various methods, including the use of KPIs in various research fields such as for example to check the effectiveness of project management.

The project efficiency is the responsibility of project manager (Griffin, 2017), whose decisions must constantly include the expected results related to the objective(s) level of fulfilment relative to the expenditure incurred (Zakrzewska-Bielawska, 2019). The more efficient the organization is, the more it achieves its goals and the more it minimizes the resources used to that end (Bielski, 2002). In the absence of the manager's required skills, we may observe an increase in the cost of individual activities, delay in the task implementation, non-compliance of the goals within the project team members, and finally the project may not be completed – the activity will be inefficient (Starosta, 2017; Biskupek & Spalek 2016; Kisielnicki, 2016; Prońko & Wojtasiak, 2016).

Taking into account the nature and mission of HEE, achieving and measuring the efficiency of their activities taken is one of the key responsibilities of its managers. It is not always a simple task, since the efficiency of project management is influenced by the following factors (Zienkiewicz, 2015):

- “percentage of the achievement of the set objectives,
- time necessary for employees to complete a task,
- financial expenditure necessary to complete a task,
- optimization of basic processes occurring during the task implementation,
- manner and methods of project implementation in the organization”.

In the theory and practice of organization management, there are many methods for measuring the efficiency depending on the criterion adopted by the managers (Pyra, 2020). In project management, project efficiency is often measured by assessing the investment projects, i.e., static and dynamic methods (Pastusiak, 2009). The static methods (the so-called simple ones) are mainly used to describe, in different ways, possible relationships between the effects and costs of a project from a specific period. Whereas the dynamic methods allow assessing the entire period of project operation (from the implementation to the performance). The time when income and expenditure occur is also of significant importance for the project efficiency. In relation to the project individual stakeholders, the efficiency is one of the most important factors which determine whether or not to implement a given project. In order to correctly determine the project efficiency, managers use, e.g., the method of opportunities and threats analysis, the method of risk assessment, the method of financial assessment of planned activities (expenditures and costs) (Pawlak, 2012).

A principal issue affecting the measurement of project efficiency is, e.g., the type and nature of project. The project efficiency is examined in a different way when an undertaking is a research project, research and

development project, general development project or is only an investment in tangible assets. Nevertheless, upon assessing the project efficiency, efficiency should not be identified with effectiveness. These concepts have a different meaning, because effectiveness refers to the degree to which the set goals are achieved, thus we are dealing with the “effect” of a given action, while efficiency refers to the optimal use of resources and determines the results to expenditure incurred ratio (M. Bielski, 2002, Zakrzewska-Bielawska, 2019). The literature identifies efficiency with efficacy (influence of praxeological approach). According to the concept of J. Zieleniewski, the efficacy of people and organizations refers to the implementation of goals and the related expenditure. In general, this efficacy consists of effectiveness (achievement of the set goal) and advantage (difference between the value of result – the so-called usable result of action/and the incurred expenditure / costs of action) or cost-efficiency (quotient of result and expenditure) (Bielski, 2002; Zakrzewska-Bielawska, 2019). An efficient person is the one who first performs the set tasks effectively, and additionally it turns out that the person performs the tasks, e.g., quickly, minimizing the costs.

Effectiveness constitutes grounds for measuring the effective project management in any organization (Kieżun, 1997). It is the main element of audit processes conducted to verify whether a given institution is effective, e.g., in acquiring and managing the projects. The analysis of efficiency involves actions taken only when it is determined that the project management is effective (the project objectives have been achieved). This is particularly important for public sector entities, which are expected to achieve the best possible results in the implementation of projects funded from external sources, including the public ones (Pyrą, 2020).

In this article, the Authors analyse the efficiency of four selected projects implemented at Gdynia Maritime University. Two of them are the general development projects conducted for more than a year, with scheduled tasks addressed to the teaching staff, UMG administrative staff, and students of individual faculties.

3. Project management performance indicators

Key Performance Indicators (KPIs) by supporting information, creating transparency as well as supporting decision-makers are important for planning and controlling projects. In order to determine the importance of key performance indicators (KPIs) for project management, the authors reviewed the literature.

Evaluation of the effectiveness of projects and the selection of appropriate KPIs is of interest to many researchers, both in foreign literature (Pfaffel et al., 2019; Kerzner, 2017; Cruz Villazón et al., 2020; Jahangirian et al., 2017; Mesároš, et al., 2021; Meier, et al. 2013), as well as in national publications (Stańczak & Zawila-Niedźwiecki, 2016; Pączek & Wyrozębski, 2018; Małecki, et al., 2019). In addition, researchers use the term efficiency, listing it as a component that has an impact on improving project management practice. i.e. leadership, communication, project teams, organization, cost, time, quality and support tools (Haji-Kazemi & Andersen, 2014; Mullaly, 2014; Badi & Pryke, 2015; Coetzer, 2016; Lahdenperä, 2016; Ssegawa & Muzinda, 2016; Zidane & Olsson, 2017). Performance analysis using parametric and non-parametric methods has monopolized the latest literature on performance measurement. However, the choice of estimation method is a matter of debate (Asmare, Begashaw, 2018). The analysis leads to reflection that the subject of project management effectiveness is still relevant. The specificity of the functioning of the university and its multidimensionality and individuality of each of them causes, that KPIs should be adapted to individual units (Stańczak & Zawila-Niedźwiecki, 2016).

From the data published in the report (KPKPB, 2022) Polish's share in the co-financing granted from Horizon 2020 is 1.21%. This shows how important it is to study the effectiveness of projects in institutions applying for grants.

P. Drucker (2003) identified, as one of the features of organization efficient management, a system of indicators that allow monitoring, evaluating and improving the efficiency of activities (Zakrzewska-Bielawska, 2019). The need for measurement in management is best expressed by the principle: "if something cannot be measured, it cannot be managed" (Cooper & Edgett 2008; Ehrenfeld, 2008). The indicators present the empirical, observed and measurable facts that adequately describe the intended goal and the state of its achievement.

The HEE operations and role in the social and economic environment mean that their decision-makers make decisions with a lower or higher level of risk. Because of funding from public sources, a number of HEE activities are undertaken based on legal provisions, both national and the European ones. It also requires the need to analyse their activities and potential threats with the use of indicator analysis (ideal quantitative tool for this purpose). As part of the indicator analysis, the activity comprehensive assessment performed, involves focusing on four segments, i.e., profitability, operational efficacy, financial liquidity and debt (Jakubczyc, 1999). The indicator analysis is used to assess various areas of activity depending on the needs and specificity

operations in a given HEE. It is assumed that measuring the efficiency should be conducted with the use of financial and non-financial, quantitative and qualitative indicators (Rydzewska-Włodarczyk & Sobieraj, 2013).

However, it should be noted that the multitude of indicators, lack of competence in their selection and measurements constitute a certain difficulty (Szczepańska, 2009). Therefore, key performance indicators (KPIs) (Grycuk 2010) play a significant role in measuring the degree of achieving the goals which enable individual entities to verify the degree of achieving the goals and fulfil the plans. KPIs used to examine the efficiency of a given activity or process include a set of individually selected financial and/or non-financial measures. As a result, they are a managerial control tool which allow detecting any problems at an early stage, reacting quickly and subsequently improving the processes.

KPIs should be simple, precisely defined to exclude any possible result manipulations, and the method of their calculation must be understandable to all project management teams and the authorities. The project management teams must also receive regular and prompt feedback on the results measured by KPIs in order to be able to improve (streamline) the assessed activities in the shortest time possible. The knowledge of HEE specific area proper operations resulting directly from the application of KPIs may result in modifying the development strategy, and also allows presenting HEE achievements externally.

For the purposes of this study, the Authors provided their set of performance indicators presented in table 1 to assess the efficiency of project management process at HEE.

Table 1. Selected project management performance indicators applied in the study

Name of indicator	Symbol of indicator	Description of indicator
Indicator of the efficiency of using the HEE employees' working time for project implementation	W_{ETP}	the ratio of the number of hours devoted monthly by a project team employee to work on the project to the number of hours settled by an employee as part of the employment relationship at the university
Indicator of the efficiency of project management team t	W_{EPZ}	the ratio of the number of the number of planned human resources scheduled to participate in a given project to the actual number of people engaged by the project manager.

Indicator of the efficiency of implementing the scheduled financial plan*	W_{REPF}	the ratio of the value of eligible costs settled under the project to the value of eligible costs planned to be settled under the project in a given HEE.
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Source: own elaboration and one* on the base of Parmenter, 2015, p. 11

These indicators focus on some of the most essential elements of the project management process. The indicator of using the HEE employees working time for project implementation (W_{ETP}) allows assessing the effectiveness of project management from the perspective of using the HEE employee working time for implementing a given project. Therefore, it is important to monitor the involvement of project team members in individual activities in the project, taking into account the nature of work they perform. Conducting substantive tasks in the project will be something different to conducting administrative tasks for the purpose of the project. Whereas the indicator of the efficiency of project management team of $](W_{EPZ})$ largely indicates the ratio of the number of planned human resources scheduled to participate in a given project to the actual number of people engaged by the project manager. Activities conducted within several departments, with the correct definition of the project implementation process, contrary to appearances, do not have to entail the need to provide extensive human resources assigned to participate in this project.

The last of these indicators refers to assessing the efficiency of implementing the schedules financial plan of the project (W_{REPF}). It is calculated by comparing the eligible costs planned to be used with the eligible costs actually settled within the project. The data necessary to calculate individual indicators is in part publicly available. The data collection is not necessary since it is mandatorily specified in the documentation provided for the project funding/account-settling entity. Nevertheless, the collection of other data by HEE authorities is voluntary and depends only on the internal necessity to analyse the efficiency of actions taken.

The efficiency of project management increasingly depends to the understanding of HEE managers of the changes occurring in the closer and more distant environment. Nowadays, the scientific, social and educational development of a higher education establishment is increasingly affected by the efficient management of available and obtained financial resources. The increased risk means that managers, to a greater extent than before, have to regularly apply tools for diagnosis and financial analysis not only to assess the

degree of achieving the set goals, but also to identify possible threats occurring in the environment and affecting the use of these funds. As a result of applying the diagnostic tools (indicators), not only the current economic and personnel situation in a given entity is better identified, but also the causes of possible disturbances. The information obtained allows taking actions to minimize the emerging threats and verify HEE development strategy implemented until now by its management.

In the process of decision-making based on facts, the fundamental core should include a logical, systematic analysis of the data obtained by selecting appropriate assessment indicators.

4. Methodology of research

In the process of data collection, the method of research in action was used, with the direct observation technique applied in the higher education establishment analysed (research in action) and the technique of direct interview with employees (project managers or their related departments) involved in the implementation of selected projects. As data collection instruments, the (Authors') observation sheet developed to that end was applied as well as standardized interview questionnaire. The Authors of this article selected from the database of UMG projects available in the POL-on2 system four projects implemented between 2017 and 2021 for detailed indicator analysis – targeted selection was applied. The collected data was subjected to comparative analysis and indicator analysis using the Authors' proposed indicators to assess the efficiency of project management (table 1.).

The selection of projects for analysis was made taking into account the following criteria:

- I. Number of Faculties involved;
- II. Spatial scope of the project;
- III. Time range of the project;
- IV. Scope of the project.

Bearing in mind the number of units involved in the University, projects with a university scope were selected, in which employees from several GMU departments were involved, with national and international projects selected, and covering the time period covering the period 2017-2021, which is identical with the last period of assessment of the quality of scientific activity of higher education units. In addition, both educational and research projects were selected.

5. Indicator analysis of the efficiency of project management in the analysed entity

Gdynia Maritime University, as a public higher education establishment, receives funds for statutory tasks from public funds. However, in order to follow the changing needs of stakeholders, university authorities have to look for alternative external sources of funding, e.g., for their scientific activity and development of administrative staff or to ensure appropriate level of student education quality. The above-mentioned activities conducted by UMG do not constitute a closed catalogue of activities. On the contrary, every year the needs of academic community change; therefore, it is so important to efficiently manage the projects within the framework of funds obtained. At UMG, competences related to supporting the application, implementation and accounts settlement of projects have been assigned to four organizational units: Department of Science (RNN), Department of Cooperation and Development (RWW), Team for Intellectual Property and Commercialization of Research (RWK) and Project Management Centre (COP).

The Department of Science, located in the Division of Vice-Rector for Science supports the proper implementation of activities in the field of research projects co-funded from budget subsidies, as well as research and development works, funded from external programs and competitions, e.g., National Science Centre, National Centre for Research and Development, programmes of the Ministry of Education and Science. Another two establishments supporting the project management: Department of Cooperation and Development and Team for Intellectual Property and Commercialization of Research are located in the Division of Vice-Rector for Cooperation and Development. The employees of the first entity, within the scope of their competences, coordinate activities related to the European projects implemented under, e.g., the Horizon Europe program, the European Economic Area Funds and the Norwegian Funds, the Interreg Cooperation Program, the Era-Net Co-Fund program, IAMU and NAWA. Whereas the Team for Intellectual Property and Commercialization of Research supports, and coordinates activities related to initiating cooperation with social and economic entities, including those supporting projects aimed to develop unique solutions with implementation potential funded and co-funded from external funds. The Team advises on intellectual property, providing support in selecting strategies for the protection of solutions developed within the projects and the distribution of these rights. The last of the four entities - the

Project Management Centre, is located at the Maritime Institute, incorporated into UMG in 2019. COP supports the activities of the Maritime Institute employees in acquiring and implementing the projects.

Between 2017 and 2021, the employees of particular UMG establishments implemented 70 projects, the total value of which amounted to PLN 205,325,861.71, including PLN 57,531,445.77 of external funds obtained for UMG, and PLN 19,723,103.17 of own contribution incurred by the university. Because of the sources of co-funding, the number of domestic projects implemented at UMG between 2017 and 2021 amounted to 31, while international projects to 39. A list of projects implemented at UMG by type of project is presented in table 2.

Table 2. GMU projects implemented in the period 2017-2021

Type of projects	Project statistics		Number of administrative employees in the project team*	Number of academic teachers in the project team *	Number of UMG employees formally supporting the project (not project members - administration)*
	N	%			
Research projects	35	50	0	5	2
R&D projects	12	17	0	5	3
General development projects	15	22	2	4	2
Training projects	8	11	1	4	3
Total	70	100			

* Average number of employees per single project

Source: own elaboration

The data presented in table 2. indicates that 50% of implemented projects are research projects. The three are general development projects, e.g., those implemented as part of the Science Social Responsibility Program and the Operational Program Knowledge Education Development. The smallest number, 11% refers to training projects, most of which implemented under the Erasmus programme. In the study targeted selection of projects for research was applied. It seems that the four projects selected for analysis will, in a relatively representative manner, allow to analyse and evaluate the developed project management efficiency indicators at UMG (table 3).

Table 3. Selected GMU projects for indicator analysis in the period 2017-2021

Project title / Project number	Name of the, Operational Programme / Activity	Project implementation date	Amount of funds for the implementation of the project (PLN)	including national budget (PLN)	including foreign funds (PLN)
JOHANNA - Join staff Qualification in SB Destinations to increase the skilled workforce in the SBS and by that ensure a sustainable SCs development in the SBS	INTERREG SOUTH BALTIC	From 15 th of August 2019 to 14 th of August, 2022	6224514.67	0.00	6224514.67
Education matters	Knowledge Education Development 2014-2020, 3.5 Comprehensive College Programs	From 1 st of Jan., 2019 to 31 st of Oct., 2022	2 405 390.37	2 405 390.37	0.00
JOHANN - Joint Development of Small Cruise Ship tourism heritage products in the Southern Baltic Sea Region	Cross-Border Cooperation Programme INTERREG V-A South Baltic Sea 2014 - 2020	From 1 st of Jan., 2017 to 31 st of Dec., 2019	8 231 620.87	0.00	8231620.87
SezAM -knowledge, competences and skills	Knowledge Education Development 2014-2020, 3.5 Comprehensive College Programs	From 1 st of April, 2018 to 31 st of March, 2022	6 123 068.32	6 123 068.32	0.00

Source: own elaboration

Two of the four projects selected for research, i.e., 'JOHANN - Joint development of small cruise ship tourism heritage products in the southern Baltic sea region' and 'JOHANNA - Joint staff qualification in sb destinations to increase the skilled workforce

in the sbs and by that ensure a sustainable scs development in the sbs' are international projects implemented within the Interreg South Baltic Programme, and funded by the European Commission. In both projects, the city of Rostock was the leader, and other partners included e.g.: an international assembly of public administration establishments, including HEE and business entities.

In the 'JOHANN' project, the main task of UMG involved developing the principles of operation and optimal management of ports in managing the tourist traffic, with the use of small cruise ships, primarily in terms of shipping problems. Whereas within the 'JOHANNA' project, UMG conducted market analysis of "Cruise Management Courses" taking into account the programs of courses implemented worldwide.

The other two projects selected for research are the general development projects, co-funded from the EU funds under the Operational Programme 'Knowledge Education Development'. The 'SezAM - knowledge, competence and skills' project is a four-year project, covering all faculties at UMG. One of its main objectives includes improving the competences of people participating in high level education so that they meet the needs of economy, labour market and society, as well as supporting organisational changes and improving staff competences in the higher education system. The second of these projects - 'Education matters' covers a smaller range and is implemented at only one faculty at UMG. The activities undertaken by the project team refer to the implementation of practical educational programs in response to the identified needs, e.g., of the Pomeranian region, included in the Pomorskie Smart Specializations Document.

As part of further analysis of selected projects, a direct interview with employees involved in implementing these projects was applied, with the use of Author's standardized interview questionnaire. The data collected are presented in table 4.

**Table 4. Variables for indicator analysis
from selected UMG projects in the period 2017-2021**

Variables	Title of a project			
	JOHANNA	Education matters	JOHANN	SezAM
The number of hours a project team member spends on project activities per month ¹⁾	from 32 h to 96 h ⁴⁾	20 h	from 32 h to 96 h ³⁾	35 h

Number of documented activities carried out at the junction of several departments within the project ²⁾	2	10	3	19
Number of planned human resources involved in the implementation of an activity in the project ³⁾	12 persons	6 persons	12 persons	15 persons
Value of eligible costs settled under the project (PLN)	720 069.90	1 009 721.77	1 188 410.88	3 443 882.66
Value of eligible costs planned to be settled under the project (PLN)	1 439 235.00	2 405 390.37	1 712 084.12	6 123 068.32

¹⁾average value – posting of hourly rate employee; ²⁾ number of repeated actions e.g., the acceptance of works or transfer of documentation for payment purposes is not included; ³⁾ number of persons indicated in the Rector’s Communication on the composition of project implementation team; ⁴⁾ Employees employed in the project are delegated to work in the project in different proportions, i.e. for 0.2 FTE (32 h) and for 0.6 FTE (96 h).

Source: own elaboration

The direct interviews conducted with persons performing managerial functions in the projects or in entities responsible for coordinating the activities related to implementing the UMG projects revealed that at UMG none of the teams analyses the efficiency of project management. When assessing the added value of completed or ongoing projects, the managers only collect data on the effectiveness of actions taken.

For the purposes of implementing the analysed general development projects, the Regulations of the UMG Rector regarding the appointment of project implementation team were published, as well as the Communications of the UMG Rector specifying the composition of a given team. The UMG employees mentioned in the above documents are partly the people who perform the administrative and substantive activities in a given project. The number of human resources scheduled to be engaged is indicated in the applications for co-funding, where the potential of establishment to implement the project is defined. A project team employee who performs substantive tasks within the project is usually (in general development projects) has the accounts settled by hourly rate as part of assigning the employee to the project. Whereas the data related to project management, administrative and reporting activities in which the employees in other UMG departments are involved is not collected separately, which results in difficulties upon calculating the performance indicators.

The interviews with project managers or units responsible for interview coordination indicate that only half of them notice the need to develop and implement the project management efficiency assessment indicators. Other respondents consider the currently implemented processes related to the assessment of projects implemented at the university to be sufficient, i.e., limited only to the assessment project management effectiveness.

The use of the Authors' indicators to assess the efficiency of project management (table 1) allowed the Authors to verify the research hypotheses.

Table 5. Value of individual indicators of the selected UMG projects management efficiency analysis

Efficiency index	Project title			
	JOHANNA	Education matters	JOHANN	SezAM
W_{ETP}	0,20 - 0,60	0,13	0.20 - 0.60	0.22
W_{EPrZ}	0,16	1,66	0.16	1.26
W_{REPF}	0,50	0,42	0.69	0.56

Source: own study

The higher the value of the efficiency index of project management team within the W_{EPrZ} project, the higher the efficiency. The obtained values W_{EPrZ} in particular analysed project are different. The highest efficiency $W_{EPrZ} = 1.66$ refers to project 'Education matters' and project 'SezAM - knowledge, competence and skills' $W_{EPrZ} = 1.26$. Whereas projects JOHANN' and 'JOHANNA' obtained much lower performance indicators i.e., $W_{EPrZ} = 0.16$. The obtained results in relation to the examined selected projects implemented by UMG allow for positive verification of hypothesis H_i ; The efficiency of task implementation process within projects is all the higher, the smaller the number of departments in an organizational unit involved in the implementation of these tasks.

The W_{REPF} indicator of the efficiency of the scheduled financial plan implementation amounts from 0 to 1, and the closer to 1 the W_{REPF} value, the higher the efficiency of scheduled financial plan implementation. In 'JOHANN' project, indicator $W_{REPF}=0.69$, which means that resources contracted within the agreement on project funding were not spent as per the financial plan and

taking into account the fact that the project was already completed, the resources had to be returned to the funding institution. Two subsequent analysed projects, i.e.: 'SezAM - knowledge, competence and skills' (4-year project) and 'Education matters' (3-year project) obtained the following indicators $W_{REPF} = 0.56$ and $W_{REPF} = 0.42$, which means that the allocated resources for project implementation were settled in less than 50% until now. The implementation period of these two projects ends in March 2022 and, of course, it can be assumed that these indicators will have slightly higher values after the project's final settlement in the funding institution, but one can also expect that the financial plan assumed in the project will not be fully fulfilled. This is worrying because these projects represent the type of general development projects and refer to undertakings which involve different forms of support provided for the UMG academic community, including students, administrative and research and educational staff, as well as investments in the university infrastructure. The situation is similar in the J JOHANN 's project, the completion of which is scheduled for August 2022. The calculated indicator $W_{REPF} = 0.5$, which means that certainly a significant part of financial resources will have to be returned to the funding institution.

In the light of indicator analysis conducted, it can be concluded that the hypothesis adopted at the beginning by the Authors that H_2 : The efficiency of the implementation of project scheduled financial plans in universities is high and amounts to 100% has been negatively verified in relation to the examined selected projects implemented by UMG. At this university, the funds obtained for the project implementation are not fully used, both in domestic general development projects and international research projects.

It is common practice at HEE to delegate full-time employees (both administrative and research and educational) to work on projects based on the decision of direct supervisor at the request of project manager/coordinator. The settlement of employee's involvement in the project implementation is based on monthly record of working hours indicating the time (in hours) devoted to task completion. Traditionally, it is assumed that employee posting can constitute from 0.1 to 0.6 of full-time work, which amounts to hourly involvement from 16 to 92 hours a month. Indicators of the efficiency of using employees' working time for project implementation W_{ETP} calculated for project "Education matters" amounted to $W_{ETP} = 0.13$, and for project 'SezAM - knowledge, competence and skills' - $W_{ETP} = 0.22$, which indicates that employees devote only from 20 to 32 hours per 160 full-time working hours a month for the implementation of tasks within projects. Perhaps here is the reason for low efficiency in spending the funds

allocated for the project implementation. If the involvement of employees in the project implementation were increased, perhaps the efficiency in implementing the project financial plan would also increase.

As a rule, HEE also has a group of employees who perform some tasks within all projects related to the scope of their basic full-time duties and are not delegated to particular projects.

6. Conclusions

On the competitive educational, scientific and consultancy market, all activities undertaken by HEE managers are subject to assessment as for the effectiveness and efficiency regarding the source of their funding. The enactment of Act 2.0 with the new mechanisms for distributing public funds for research and development means that one of HEE key tasks involves efficient use of funds obtained both from the state budget and from extra-budgetary sources.

To be efficient in project management, HEE decision-makers should take steps to develop and implement mechanisms to collect data related to performance indicators of individual activities. However, this does not mean that all projects and processes in a given unit should be subject to monitoring and, subsequently, efficiency assessment. The elements subject to detailed analysis should be selected after a detailed and reliable analysis of the current state of their implementation by staff delegated to perform these activities.

In this article, the Authors deliberately selected only a few projects which are complex and require the involvement of many departments. It is impossible to compare projects in which progress and effectiveness are determined by completely different indicators.

There may be additional indicators and projects that the Authors could choose but the aim was to arise discussion about projects and their effectiveness in HEE.

In undertaking activities and projects that are effective for the operation and development of HEE it is significantly important for decision-makers to understand that regardless of the number of projects acquired (and thus the financial resources obtained), the efficiency of their implementation also depends on human resources and willingness and motivation of the project team members. Therefore, in this article the Authors proposed a set of criteria for assessing the efficiency of project management in higher education establishments (HEE), also taking into account these aspects (Prussak & Wyrwicka, 1997). Thus, they answered the first of research questions posed at the very beginning.

These criteria are reliable and easy to apply and can significantly contribute to increasing the professionalization of project management at HEE (Kwiek, 2015). Therefore, the issues of measuring the efficiency of using funds obtained for their activities from various sources should be appreciated by decision-makers at universities and developed by researchers.

The analysis conducted proves that there are a number of projects implemented at Gdynia Maritime University, with financial resources including, apart from internal, also external, domestic and foreign funds. UMG only analyses the effectiveness of resource application, i.e., the degree of achieving the goals scheduled in the project. They do not analyse the efficiency of project management. Therefore, they do not measure the costs incurred relative to the results obtained, which, in the opinion of the Authors of this study, should occur. Therefore, the answer to the second research question posed in the study is not affirmative. In order to recommend, with confidence, to the analysed university the application of proposed criteria for assessing the efficiency of project management, the Authors calculated these criteria for the four analysed projects. The obtained results allowed positively verifying hypothesis H_1 providing that the efficiency of task implementation process within projects is all the higher, the smaller the number of departments in an organizational unit involved in the implementation of these tasks. Whereas hypothesis H_2 stating that the efficiency of implementing the project scheduled financial plans in universities is high and amounts to 100% was proven false. Whereas H_3 : indicating that the employees of projects implemented at HEE delegated to work on a project are provided insufficient number of hours assigned to this task, was also confirmed.

The calculated values of indicators proposed by the Authors (table 5.) constitute grounds concluding that effective project management at HEE is not an easy task. The awareness of decision-makers on the need to collect data to assess the efficiency of implemented projects should result from the need to analyse, evaluate and improve systems affecting the efficiency of a given unit as part of the project implementation (Pączek & Wyrozębowski, 2015).

The authors are aware that the conducted analysis and the conclusions resulting from it refer only to the researched, deliberately selected projects carried out at UMG and cannot be broadly generalized. Hence, also the verification/falsification of the adopted hypotheses only applies to the university under study. Nevertheless, the conducted analysis shows - on the example of a selected university - the need to study the effectiveness of projects implemented at HEE in order to rationally manage funds obtained from outside and to improve the project management system .

The conducted research also shows the limitation which is the necessity to select an appropriate number of projects for research using the developed indicators, so as to obtain the comparability of the obtained results.

In future research, one could assess how the indicators can be used to assess projects. Research on questions such as which of presented indicators helps the most in determining the progress of the projects.

Limitations and recommendations

The results of the research and analysis carried out are based on a detailed case study of specific projects and a deliberately selected higher education institution. Therefore, the results of the research carried out in this article cannot be generalized to other such higher education units., or rather, for each of them, it would be necessary to carry out a separate analysis taking into account the specificity of the implemented projects. It is important to be aware of the fact that only selected variables for the implementation of projects have been analyzed and in further research it would be justified to expand the cafeteria of variables and indicators and develop an integrated algorithm that could be applied flexibly to projects of equal types.

Summary.

Efficiency of project management in higher education establishments on the example of Gdynia Maritime University

Project management is sufficiently described in the source literature. However, numerous published scientific works refer mainly to examples of good practice in project management in business entities, and unfortunately higher education establishments (HEE) are marginally analysed. Therefore, the analyses defined in study aim to evaluate the performance indicators of project management in universities, on the example of Gdynia Maritime University. In the studies the research in action method was applied as well as the technique of direct interview with project or department managers involved in the project implementation. The analyses covered selected projects that were implemented at the University between 2017 and 2021. Moreover, research questions were formulated, i.e., 1) Which indicators are used to assess the efficiency of project management at HEE?, 2) Does the surveyed HEE analyse the project management efficiency

assessment? In order to conduct the study, the Author's indicators were proposed to assess the efficiency of process management during the implementation of projects in HEE and these were applied in the analysis presented in this article. It was found that the surveyed university does not apply indicators to assess the efficiency of project management. Whereas the usefulness of indicators proposed by the Authors to study the efficiency of project management was confirmed by calculations performed. On these grounds, the Authors recommend the University authorities should consider implementing these indicators.

Keywords: *Indicator of the efficiency, project management.*

Streszczenie

Efektywność zarządzania projektami w jednostkach szkolnictwa wyższego na przykładzie Uniwersytetu Morskiego w Gdyni

Zarządzanie projektami jest solidnie opisane w literaturze przedmiotu. Jednakże liczne opublikowane prace naukowe odnoszą się głównie do przykładów dobrych praktyk w zarządzaniu projektami w podmiotach gospodarczych, a niestety jednostki szkolnictwa wyższego są traktowane marginalnie. Celem badań w niniejszej pracy jest zatem ocena wskaźników efektywności zarządzania projektami w uczelniach wyższych, przy czym jako przykład wybrano Uniwersytet Morski w Gdyni. W badaniach posłużono się metodą obserwacji uczestniczącej oraz techniką wywiadu bezpośredniego z kierownikami projektów lub działów zaangażowanych w realizację projektów. Badaniom poddano wybrane projekty, które realizowane były na Uczelni w okresie 2017-2021. Sformułowano również pytania badawcze tj. 1) Jakie wskaźniki wykorzystywane są do oceny efektywności zarządzania projektami w HEE?, 2) Czy w badanej HEE prowadzone są analizy oceny efektywności zarządzania w projektach? W celu przeprowadzenia badań zaproponowane zostały autorskie wskaźniki oceny efektywności zarządzania przy realizacji projektów na uczelniach i zastosowano je w analizie zaprezentowanej w artykule. Stwierdzono, że badana uczelnia nie stosuje wskaźników oceny efektywności zarządzania projektami. Natomiast użyteczność tych zaproponowanych

przez Autorki do badania efektywności zarządzania projektami potwierdziły przeprowadzone obliczenia. Na ich podstawie Autorki rekomendują władzom Uczelni rozważenie możliwości ich wdrożenia.

Słowa kluczowe: wskaźniki efektywności, zarządzanie projektami

JEL Classification: D00; I2

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