

Managing a Cross-Disciplinary Research Project in a University: The Case of LEARNIT

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Abstract—This paper explores the main issues related to implementing a cross-disciplinary research project (LEARNIT) based on collaboration between universities from three European countries. The paper discusses the importance of using the holistic approach to managing scientific projects with due account for the complicated nature of the educational environment of a modern university. To illustrate this approach, the author describes some actions to be taken for supporting different focus areas of LEARNIT project, in the process using integrated tangible, non-tangible, and semi-tangible resources of the partner university. The methodology of the paper is based on the academic literature and research papers analysis within management discipline. The analysis reported in the paper is also based on the author's professional experience in the area of managing international research projects in a university.

Keywords—LEARNIT, focus area, project management, resources.

I. INTRODUCTION

THE European Research Area was launched in 2000 [1] for implementing the Lisbon Strategy. Modern higher education linked to research and innovation plays a crucial role in maintaining economic growth and prosperity, in stimulating individual and social progress by providing the highly skilled human capital for supporting knowledge-based economies [2]. Today, more and more European higher schools are engaged in international scientific projects. Fundamental activities of a university are teaching, research, social and economic service [3]. In this context, international research projects make a valuable contribution to the development of an academic institution. At the same time, the community also has certain benefits from the project in the form of a new product or service.

The challenges faced by managers in the process of implementing an international cross-disciplinary scientific project are related to the complex nature of the educational environment of a contemporary university. It can be regarded as a non-linear multi-level super-system embracing a set of integrated organizational resources [4]. The educational environment can also be viewed as a community of people united by shared goals, and the intellectual capital is the link binding different levels of the educational environment [4]. This proves the importance of employing the holistic approach to the management of various integrated resources involved in the cross-disciplinary project realization.

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II. LEARNIT PROJECT DESCRIPTION

A. LEARNIT Project Participants

Partnership of three higher education institutions from three countries was organized to implement the LEARNIT project: WSEI (University of Economics and Innovation, Poland), KVK (Klaipeda State College, Lithuania), and TSI (Transport and Telecommunication Institute, Latvia). While each university has its own personality and area of expertise, the above universities are now working together to undertake complex cross-disciplinary research. The rationale for setting up the partnership is described below.

WSEI is now conducting a series of research on the impact of external stimuli on the level of students' concentration. TSI has big experience in conducting different types of research including those under the *Seventh Framework Programme for Research and Technological Development (2007-2013)*. KVK, being the third-largest college in Lithuania, has strong academic reputation. Therefore, the project partners have sufficient experience in managing complex research projects, employing sophisticated equipment and attracting qualified specialists in a particular research area. As all partners have been formerly involved in various research activities, they have well-equipped laboratories necessary to support the implementation of LEARNIT.

B. LEARNIT Rationale and Anticipated Results

The quality and amount of work students can perform depend not only on the effort they put in, but also on their ability to concentrate for long periods. Fatigue, anxiety about completing assignments in time, exhaustion and emotional pressure can cause concentration problems as well. Students easily become distracted by irrelevant sights and sounds, so they fail to pay more attention to details and making careless mistakes.

For enhancing concentration, it is necessary to control students' stress levels, create an appropriate environment, and use strategies assisting students to get and stay focused on the task while studying [5]. Improving educational outcomes will require many different efforts, but a good solution to the problem would be to help students better regulate their learning by using effective educational techniques [6]. This can be done taking the advantage of modern technologies, which are designed to enhance the quality of teaching and learning and educational outcomes.

The innovative solution proposed by WSEI in the framework of LEARNIT project is aimed at improving the effectiveness of learning mathematical content by stimulating the level of concentration according to personal rhythm of a

student. The main results of the implementation of LEARNIT are supposed to be the properly equipped Learning Lab and software for mobile devices intended for enhancing the effectiveness of the learning process by stimulating students' concentration. A series of experiments are now being conducted in the Learning Lab. The developed software will be utilized to prepare personalized recommendations for every student who will participate in a set of sessions in the Learning Lab within the period of project implementation (2014 – 2017).

C. LEARNIT Research Tools

As far as this, there is only one mobile device, which can measure the level of concentration during daily activities. The Melon headband is a wireless brain-sensing device that uses EEG (electroencephalography) to measure brain activity; it tracks users' mental focus during a range of activities [7]. Nevertheless, this device is still in its testing phase, and it is not designed with the express aim to support learning activities in a higher school. LEARNIT project is based on similar technology, but it is devoted to facilitating the learning process and improving scientific achievements of students.

In the framework of LEARNIT, different tools for testing students' cognitive abilities, their motivation, and their level of mathematical skills are supposed to be used. Mathematical tests were prepared together by researchers from partner universities taking into account the program of the Khan Academy and instructions of European Commission on assessing key competences [8].

Psychological tests are employed in the frame of the project to measure cognitive abilities and motivation of students. Some of them are included in the Vienna Test System – International system of psychological tests [9]: DAUF test (aimed at assessment of long-term selective attention and concentration and of general performance and commitment); NVLT (aimed at assessment of non-verbal learning); AHA (measures respondents' aspiration level and frustration tolerance). Two more psychological tests were also chosen for the project's purposes: LMI (the Achievement Motivation Inventory) developed for measuring achievement motivation [10], and SPM (Raven's Standard Progressive Matrices) developed for use in fundamental research into the genetic and environmental determinants of "intelligence" [11]. This set of tests is supposed to allow researchers to measure the established factors. Students have to fill in these tests at the beginning and at the end of the project (after conducting sessions in the Learning Lab). Then the results will be compared. This will help to determine if, and to what extent, stimulation of the concentration contributes to the effectiveness of the learning process.

In the Learning Lab, students have to carry out a set of mathematical assignments in the Khan Academy environment. The obtained data will be sent to WSEI researchers who will prepare the software for mobile devices based on the recorded rhythm of concentration of an individual student.

III. MANAGING LEARNIT PROJECT: USING AN INTEGRATED APPROACH

The project description presented above shows that the management of LEARNIT is supposed to be a complicated many-sided process. It demands integration of various resources, pedagogical and managerial techniques, as well as mutual efforts of different people involved in the project: scientists, managers, teachers, engineers and students. Thus, an integrated approach to managing the project should be applied in this context. Operationally, integration means that all major dimensions of project are combined, each dimension being connected in one integrated domain; a set of knowledge, skills, tools, techniques is used [12].

Project management is accomplished through the application and integration of different processes including planning, scheduling and control [13]. Project management is aimed at achieving a set of objectives through involving organization, planning and control of resources assigned to the project [14]. It is also aimed at constructing human relationships in the course of action; project managers usually operate in a very complex environment dealing with people and resources from different domains [14].

There are some common project management challenges, such as managing distributed and matrix managed teams, issue tracking, resource management, prioritization, etc. [15]. However, every project, being unique in nature, generates different challenges. The major challenges faced by managers and researchers responsible for LEARNIT project can be summarized as follows:

- 1) LEARNIT is a multidimensional cross-disciplinary research project that engages people from different departments of the university, people of different professions and positions.
- 2) Besides, students are supposed to be actively involved in its major activities. The project results are to a large extent dependent on the students' contribution to the project.
- 3) The project demands strong integration of all available resources – administrative, technological, educational, etc., which are heterogeneous in nature.
- 4) The temporary nature of the project organization is also a big challenge for LEARNIT managers.
- 5) Due to the complicated nature of the project partners must assess their progress and establish a set of qualitative and quantitative indicators to be used on a regular basis. This aspect is of a particular importance, since constant query for progress and its measurement in relation to goal achievement are regarded vital prerequisites for success [16].
- 6) It also should be mentioned that projects involving ICT, are sophisticated and demand appropriate management of all potential difficulties and ramifications [17].
- 7) LEARNIT project is implemented by three higher education institutions, so project management occurs at different levels. Project Leader (WSEI) is responsible for the entire project management, delegating and assigning tasks to partner institutions. Project partners perform the

tasks assigned to each partner in the bilateral agreement. This also requires proper coordination of all activities and available resources.

Since it is not possible to consider the project in all its

aspects, the author will address a few essential issues of managing LEARNIT in one of partner institution – Transport and Telecommunication Institute (Latvia).

TABLE I
LEARNIT FOCUS AREAS

Project Focus Area	Project Activities	Actions to Be Taken in the Frame of LEARNIT Implementation
University services and facilities	Constructing the Learning Lab and installing the equipment	Establishing cost-effective ICT-based project infrastructure for achieving sustainable project performance
Educational constituent of LEARNIT	Conducting sessions in the Learning Lab	Providing integrated ICT-based educational resources for supporting sustainable learning process
Research constituent of LEARNIT	Organizing mathematical and psychological testing of students	Increasing research opportunities by using advanced project infrastructure
Academic and research staff	Processing the tests results	Creating a detailed job description for each role in the project team and recruiting best academic and research staff based on their relevant skills and experience

IV. LEARNIT IMPLEMENTATION: MAIN FOCUS AREAS

With due account for the complicated nature of the educational environment of a modern university, the holistic approach to managing a cross-disciplinary research project should be used. A higher education institution is considered as a complicated organization that contains different interrelated units, the academic and research strengths of this organization being supported by a variety of internal resources. These resources are aimed at accomplishing academic and research excellence in the competitive external environment. The internal resources of a university include tangible (non-human), non-tangible (human) and semi-tangible (representing the personified intellectual capital) [18], [19]. They are heterogeneous in nature, and embrace the integrated non-linear multi-level educational environment.

The total management of the integrated educational environment covers different levels and functional areas and is directed towards achieving synergy necessary for attaining education-specific goals [20]. The overall management of a cross-disciplinary scientific project, being an integral part of the inclusive management of a university, is based on the same principle. However, research projects in a higher school have to be managed on account of their specific nature.

The activities undertaken in the framework of managing LEARNIT cross-disciplinary project involve, among other things, identifying heterogeneous resources necessary for the LEARNIT implementation. For this purpose, it is vital to identify key functional areas involved in the project realization. Besides, it is also crucial to create an effective coordination mechanism across the university. Such mechanism will also include a well-organized knowledge transfer scheme necessary for the new knowledge creation and sharing of the obtained knowledge.

The following categorization of functional areas of a modern university is proposed by [20]: 1) the university services and facilities (a combination of tangible, non-tangible and semi-tangible resources); 2) the educational constituent (a combination of tangible, non-tangible and semi-tangible resources); 3) the research constituent (a combination of tangible, non-tangible and semi-tangible resources); a) academic and research staff (non-tangible resources). In the same way, the LEARNIT project implementation occurs across different functional project areas. In the process,

managers use an arrangement of combined resources, which are aimed at achieving sustainable project performance. In the context of LEARNIT, special emphasis is to be given to generating and sustaining excellence of its technological, educational and research constituents, which, in turn, is based on improving the quality of university services and facilities and attracting qualified academic and research staff. The actions to be taken for accomplishing sustainable project performance are specified in the overall project plan, which forms the basis for project management efforts related to successful project implementation. The focus areas of LEARNIT, the main activities to be executed during its implementation, as well as some supporting actions to be taken by project managers, are described in Table I.

From the holistic perspective, managing integrated heterogeneous project resources across different functional focus areas requires using various management procedures. The use of different management techniques may take any of the forms described below.

V. LEARNIT: USE OF INTEGRATED MANAGEMENT TECHNIQUES

Project management embraces special management techniques for better planning, organizing and controlling the established resources [21]. These techniques can take different forms. However, in the complex LEARNIT project environment characterized by cross-disciplinary nature, managers are faced with a number of challenges (mentioned above) that need various management approaches to be applied for providing the project sustainability.

The ability of the university services and facilities together with the related attending staff support to have an impact on the project performance is an important prerequisite for the project success. ICT-based infrastructure is vital for generating resources necessary for undertaking actions specified in the overall project plan. Moreover, university services and facilities may significantly influence student satisfaction, which is regarded as an important quality factor in educational settings, a key product of higher education. [22], [23]. Facilities management is defined as an integrated approach to handling infrastructure of an institution for creating an environment that strongly supports the main objectives of this organization [24]. It provides the added

value – the customer perceived contribution of the different services to the organization [25]. The mission of facilities management in LEARNIT project is to effectively provide maintenance, operational services and utilities services. These services being directed toward the pursuit of sustainability in the maintenance and operation of the project infrastructure,

will support the project staff and students in their work.

In the context of the overall management of the integrated educational environment, facilities management is accompanied by other management practices [26]. This is also applicable to the management of a cross-disciplinary research project conducted in a higher school (Table II).

TABLE II
SOME INTEGRATED MANAGEMENT PRACTICES TO BE EMPLOYED IN THE FRAMEWORK OF LEARNIT

Management Practice	Key Attribute
Facilities Management	Managing the project by providing maintenance, operational and utilities services
Knowledge Management	Managing the project by supporting knowledge enhancement of the project environment
Information Management	Managing the project by constructing and exchanging collaborative knowledge through creating an ICT-based system of internal communication
Human Capital Management	Managing the project by means of collecting and utilizing the intellectual capital generated in the course
Customer Relationship Management	Managing the project by establishing interaction with the university students participating in LEARNIT
Total Quality Management	Managing the project by means of monitoring outcomes with the help of established qualitative and quantitative indicators

The above management practices are all aimed at achieving project performance sustainability, each being intended for supporting a particular project focus area (or different focus areas). However, the list is not complete, since every project is unique in nature in terms of the problems that arise, the priorities and resources being used, the environment in which project participants operate, and the project manager's attitude and style used to organize, monitor and control the project activities.

VI. LEARNIT PROJECT EVALUATION AS PART OF ITS QUALITY MANAGEMENT

A separate topic to be discussed in relation to the specificity of LEARNIT project is student engagement in the project activities. Eventually, the success of any project depends on the project managers' ability to manage the expectations of its key stakeholders, as they can significantly improve the progress and relevance of this project [27].

The appropriate involvement and management of stakeholders, who represent specific interest groups served by the outcomes of the project, is considered to be a critical success factor of a project [28]. As LEARNIT involves quite a big number of students (to be exact, seventy-two) as direct stakeholders, it is of primary importance to engage them in the quality management procedures.

Owing to the complex nature of LEARNIT managers have to recurrently evaluate their progress using a set of qualitative and quantitative indicators. Quality assurance techniques are now widely used in the management of schools and universities [29], customer focus now playing an important role in education, since every educational output has customers [30]. Stakeholder representatives contributing to the educational purpose of the organization should also be engaged in the management process [31].

Transport and Telecommunication Institute is a private university, where the majority of students are fee-paying students. In the customer-driven education context, it is important to use more customer-oriented philosophy. The learner-centred evaluation of the project environment takes into account students' opinions on the project implementation. It is based on seeking constructive feedback from students, the

emphasis being put on student satisfaction and student motivation. Student surveys as part of the project environment evaluation are aimed at assisting project managers to monitor the progress and to generate diagnostic data on the project implementation. Obviously, the students should be provided with information about responses to student evaluation data.

The LEARNIT management has prepared a set of questionnaires to be used in the framework of Customer Relationship Management and Total Quality Management, but it is a talking point for further discussion in a separate paper.

VII. CONCLUSION

The paper has discussed some basic actions to be taken in the frame of accomplishing sustainable project performance as a response to the major challenges faced by managers and researchers responsible for the LEARNIT implementation. In the paper, it has been argued that in the context of a cross-disciplinary research project conducted in a university, special emphasis should be given to generating and sustaining excellence of its technological, educational and research constituents. This, in turn, is based on improving the quality of university services and facilities and attracting qualified academic and research staff.

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