Features of the Case Method Application in the Study of Disciplines Related to Information Technologies and IT Project Management

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ABSTRACT

The paper shows the features of the application of the case method in the study of the discipline of IT project management for students majoring in the field of Information Technology. This work analyzes some of the difficulties associated with the limited use of case studies in the field of IT. An original solution to the problem of combining flexible technologies for the development of the project itself on the basis of a case study and methods of studying and applying special software for IT project management presented by authors. The conceptual scheme of the main stages of work with a case, interrelations and content from an initial acquaintance, discussion in groups and acceptance of intermediate decisions, to planning of operations, calendar planning of works and resources was shown. However, the role of special software for visualization of separate stages of project execution management in the MS Project environment at all stages of the life cycle was explained. The combination of individual analytical work of the students, acquisition of teem job skills, the study of MS Project tools, IT project management methods at different stages allows to achieve the planned learning outcomes and develop interdisciplinary competencies.

Keywords: case study, IT project management, MS Project, teem job skills, educational proses

1. INTRODUCTION

For many years in a row, case study as a method of teaching maintains leading positions, actively used in the practice of business education and is considered one of the most effective ways of teaching students the skills to solve typical problems. Thus, the Harvard Business School allocates almost 90% of study to analyze specific cases, while maintaining the priority of methodological research in business training [1]. The essence of the case method is that students are invited to comprehend a real life situation, the description of which cannot only show any practical problem, but it actualizes a set of knowledge that must be mastered in solving of this problem. "The case method creates an environment in which participants not only absorb facts and theories, but also exercise leadership and teamwork skills in the face of real problems" [2].

According to Bloom's taxonomy, the application of the case method activates different levels of human cognition - memorization, thinking, learning, as well as understanding, evaluation [3]. This is an important factor in choosing teaching methods and providing both professional and general competencies. The case method provides a creative approach to solving of the problem, the availability of several options for its solution, stages of discussion, discussion of decision-making options, teamwork. Traditionally, cases are used in the study of disciplines of economics, management, marketing, entrepreneurship. However, the introduction of the case method in the study of disciplines related to information technology and information systems causes some difficulties. This fact is explained by the circumstance that such disciplines have a fairly structured amount of factual material to study, the lack of diversity of concepts and so on.

The purpose of this work was to expand the understanding of the possibilities of the case method and show the application features in combination with the study and use of special software in the study of the discipline of IT project management.

2. BACKGROUND

The authors practice the case method when studying the functionality of information systems management such as ERP and CRM for students majoring in "Management", "Marketing"

for more than 6 years. In works [4-6] methods of using situational tasks were described, which were developed by a group of teachers while studying of CRM system Bitrix24 and others based on cloud technologies. These cross-cutting tasks allowed to model the performing of real tasks for the management of departments of the enterprise by introducing into the learning process IS Bitrix24, Soft Farm and creating an enterprise model in them. The functions of administrators and executors were distributed among students during classes in the environment of the information system. Access to modules cloud service systems and registration for online work were carried out directly from workplaces through the Internet. This comprehensive approach has allowed to develop both professional competencies and the ability to use information systems in professional activities, apply them for making management decisions.

IT project management disciplines are a mandatory component in the preparation of bachelors and masters in training in the specialties of information technology branch in most European universities. Prospective professionals during training should not only learn several programming languages, become developers, architects and administrators of information systems and networks, but also gain teamwork skills, so-called soft skills, project work management, the ability to assess the quality of work, namely to become project managers in real working conditions of IT companies. As defined by Gartner, project management is “the application of knowledge, skills, tools and techniques to project activities to meet the project requirements” [7].

The choice of methods and tools of teaching of IT project management is considered as a problematic aspect by many teachers of various universities, colleges, etc. For example, Whitty and Schulz [8] substantiate the advantages of teamwork compared to traditional methods of teaching, note the responsibility of the teacher's task at all stages of work and evaluation of student work, but do not discuss the case method. Competition, mixed and collaboration based learning approaches and their results by comparing them with other learning methods used during the Software Project Management course were analyzed in detail in works [9, 10]. The authors note that each of the techniques cannot be considered the best, has its strengths and weaknesses. The best results were obtained, however, when combined. All learning approaches described within that articles may prove both beneficial and disadvantageous from a certain point of view depending on the context of their employment.

Key aspects of DevOps as a modern paradigm of formation and effective work of teams in the development and implementation of IT projects were considered in work [11]. The concept, that was presented describes the steps for rapid and reliable creation, testing and implementation of IT products for operation in production conditions and is based on building of constructive cooperation between all members of the project team. The positive aspects of teamwork are the introduction of the concept of shared responsibility, transparency and faster feedback.

None of the above methods is universal and exhaustive, all have some limitations and need additions, improvement, deepening. Therefore, when developing a course in the discipline of IT project management, which students majoring in specialty of "Information Systems and Technology" studied for the first time in the 4th year of bachelor's degree, it was decided to apply the case method, but also take into account the specifics of the discipline.

The object of discipline’s study is the process of managing of the creation and implementation of any project in the field of IT using special software. The difficulty of building of an effective case for the investigation of the peculiarities of work at all stages of this project type can be explained on the basis of several key points. On the one hand, the creation of an IT project involves a comprehensive analysis, understanding and detailed planning of all necessary operations, all types of resources, scheduling, monitoring the effectiveness of implementation throughout the project life cycle. Herewith the preparation of successful cases for training gives the opportunity to take into account all requirements for creation of professional situations in educational process, to organize work and discussions in groups, to develop skills of work in a team, to achieve gradual flexibility and a choice of the best decisions at each stage of project development and promotion.

On the other hand, realization of the IT project involves the use of special software, which is designed specifically for project management, has sufficient tools for processes visualization, monitoring the status of the project at any stage. Herewith features of the educational schedule are taken into account: students work on the project for a certain period, all intermediate results must be saved to be able to continue working after some time. The process of creating and managing of a project by students at the initial stages should be controlled by the teacher (project trainer, stakeholders). Therefore, according to the existing standards of business intelligence the MS Project program has been selected as the environment and tool for project realization, as one of the software options for project planning and management. Alternatively, Project Plan 365 can be considered.

3. MAIN STAGES AND RESULTS OF IT PROJECT MANAGEMENT STUDYING BASED ON THE CASE METHOD

Substantiation of the choice of case method and software in the study of the discipline of IT project management

Probably, it is necessary to briefly outline the content of preparatory work before the introduction of the case method in the educational process. Working with projects in MS Project Planner requires some preparation before and during data entry. It includes the following key stages.

- Choice of planning method.
- Establishing of relationships between different tasks.
- Estimation of duration of the included works and separate stages.
- Setting restrictions on dates and times.
- Distribution of available resources.
- Finding a critical path.
- Finding solutions to reduce deadlines.

At each of the described stages a certain set of functionalities of the planner is applied. It is common practice to study MS Project software tools as stand-alone short tasks using abstract examples, often unrelated. For example, in one lesson, students set up a calendar, in another they make a list of tasks, then make a list of resources, and so on. Essentially, these are reproductive teaching methods that do not give an idea of working on a holistic project, and therefore do not always give the expected effect.

There was considered a different approach in this paper: teachers of the discipline decided to consider and gradually place in the environment of MS Project immediately a complete project – the one that was developed and discussed by students while working with the case. In order to anticipate difficulties and errors in working with the project and software tools, teachers conducted their own project in parallel and gave brief instructions with recommendations for the use of certain options, menu items, etc. Microsoft Project's own project example has helped to

understand the options and settings of the program, as well as showed its capabilities for managing a large-scale project, where all the details are interconnected.

Experience shows that the use of the case method, the preparation of cases requires teachers to spend considerable time to develop their own creative and professional skills, provides a willingness to take risks and learn from accidental failures and mistakes. Due to an integrated approach to training, consultation with practitioners, self-reflection and maintaining feedback from students and colleagues, teachers reveal that this method allows them reveal their knowledge and inspire students to work and study creatively. An idea that this method borders on art and craft is confirmed every time after the ending of a training cycle.

The main stages and features of working with the case

Two academic groups of students numbering 12 people, who study by specialty Information Systems and Technologies with bachelor level of higher education at the Department of Information Systems and Technologies of Poltava State Agrarian University in Ukraine, took part in the discipline of IT project management using the case method. To achieve the planned results in the learning process, a combination of the case method with other teaching methods was used: lectures, individual execution of tasks. When constructing the case, there was taken into account the preliminary training of students, which includes:

- basic knowledge of economics and management;
- sufficient application of information technology and systems;
- knowledge of modern programming languages;
- understanding the essence of the information systems design process;
- internship at enterprises that implement information systems in the agricultural sector, enterprises and organizations.

At the beginning of the study of the discipline, there was made a decision to consider in detail one pre-designed case to develop the main initial skills of working with an IT project. Herewith, it was important to ensure a creative approach both in the development of all the details of the project and in the implementation of its plan in the environment of the selected computer program. The conditions of the standard task for an IT company were described in the case - to create the most effective development project of an information system for managing the activities of the enterprise-customer for implementation and further use.

The case contained the necessary general data, was quite brief, did not contain excessive details of the conditions, instead relied on certain assumptions, and required the collection of additional information from external sources. The situation described in the case is the product of a combination of certain conditions and problems that are regularly discussed by teachers and stakeholders of the educational program - representatives of the IT business, which develop and implement modern information systems. Students did not develop the information system itself, but modeled the whole process of organization at all stages and the list of works within the project's creation of implementing an information system for managing the financial activity of a customer enterprise while working on the project.

An additional feature of the process of working on the case was its division into logical parts and execution during at least 8 practical classes (16 hours), as well as the need for additional individual training between classes. The theoretical part of the course contained all the topics for learning the basics of project activities.

General logical scheme of work on the case, the relationships and content of its separate stages are show in Fig. 1. The arrows show the directions of review and correction of decisions at certain stages of the project.

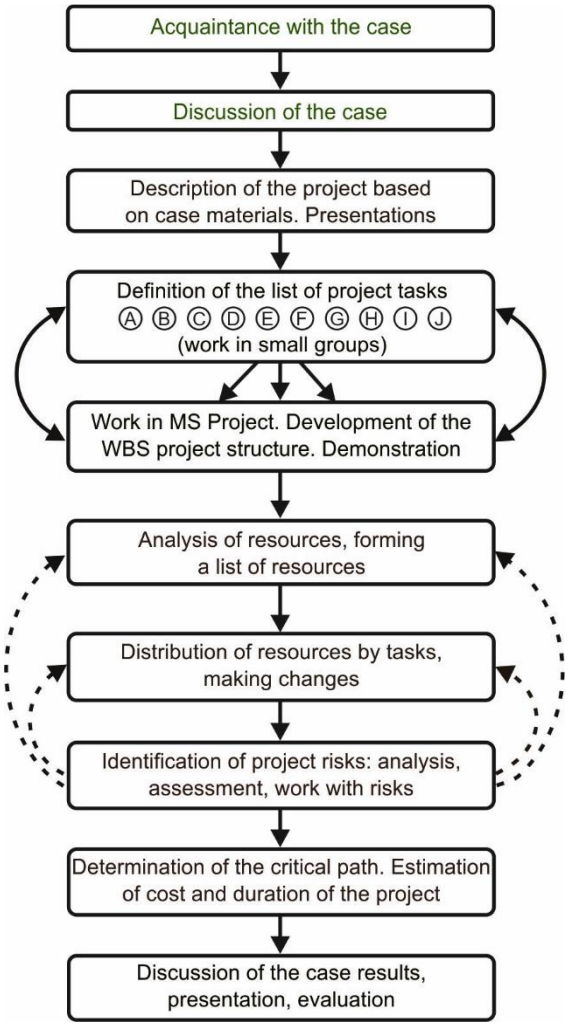

Fig. 1. General logical scheme of work on the case

Consider in more details the content of the work under the proposed case.

After reviewing the case, discussing and identifying an achieved understanding of its conditions, students were given the task of the first stage: to create a description of the project, which includes a brief annotation, purpose, uniqueness, objectives, project methods, determining the results of its realization and economic effect. This task showed how well the students have mastered the theoretical material on the relevant topics of the course and worked on the recommended literature [12]. At this stage, students studied similar projects, applied short discussions and brainstormed, acquired and improved the ability to formulate goals and identify steps to achieve them. There was held a discussion of the presented descriptions of the project at the end of the stage, adjustment of details, and determination of the optimal variant.

The next stage is to work on clarification of the details and drawing up a general plan: forming a list of necessary operations carried out by the project developer's team from start to finish. To start work, 10 basic tasks were clearly defined and named as a result of the discussion, taking into account the possibility of adding and specification of operations in the future, their further

division into subprocesses, as well as the presence of such operations that can be performed in parallel. Students were asked to think in small groups and develop network models of project realization using any graphical applications. After completion of the task, some differences were founded in the presentation of the sequence of work completion, what immediately demonstrates the differences in projecting and perception of the task. For example, in Fig. 2, a, b, c, some of grid graphs are exposed that were compiled independently by each group of students (or individually) during the second lesson.

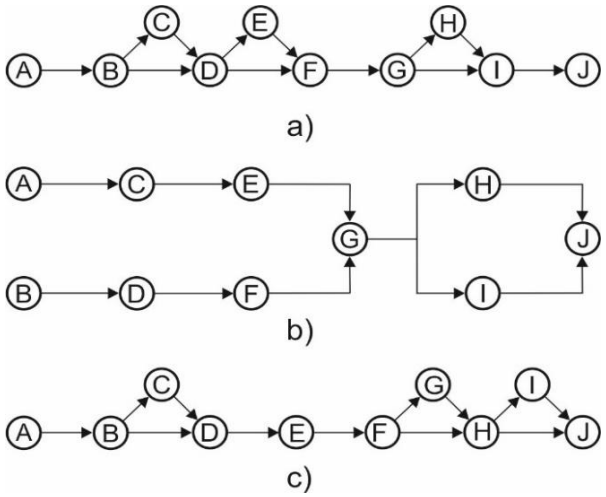

Fig. 2. Examples of grid graphs (a, b, c) of the order of project operations, which were performed by groups of students

There should be stated that during the work on the project elements of agile technologies were used, project participants knew that in the future it is allowed to make adjustments in the course of a better study of project behavior, including returning to the previous stages [13].

As long as the grid models contain information only about the number and sequence of works, the next stages of project planning and management were carried out in the MS Project environment. As long as the grid models contain information only about the number and sequence of works, the next stages of project planning and management were carried out in the MS Project environment. A short time was allotted for setting the project calendar and key dates, navigating the main interface panels: Task, Project, Resource and others. Combining the study of the tools of the program itself, students simultaneously entered the basic data about the project: the type of project - "from the beginning of execution", the list of operations (according to the defined list), previous and subsequent operations. Information on the possible duration of each of the operations was previously discussed on the basis of data on similar activities in real enterprises. Students had the opportunity to obtain such data during internships at enterprises, from their own experience and in the study of other professional disciplines. At this stage, subordinate operations were added in order to distribute the time of individual tasks in more detail. The result of the WBS project had the form shown in Fig. 2. Combining the study of the tools of the program itself, students simultaneously entered the basic data about the project: the type of project - "from the beginning of execution", the list of operations (according to the defined list), previous and subsequent operations.

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At this stage, subordinate operations added in order to distribute the time of individual tasks in more detail. The result of the WBS project had the form shown in Fig. 3.

This visualization is more powerful because it allows you to set the duration of each stage of the project and determine the total duration, foreseen time reserves and understand their importance for flexible project management within the training case. It turned out that in real conditions such a project lasts up to a year, but thanks to the MS Project planner it is possible to manage processes and make adjustments in each of the periods both in the past and in the future

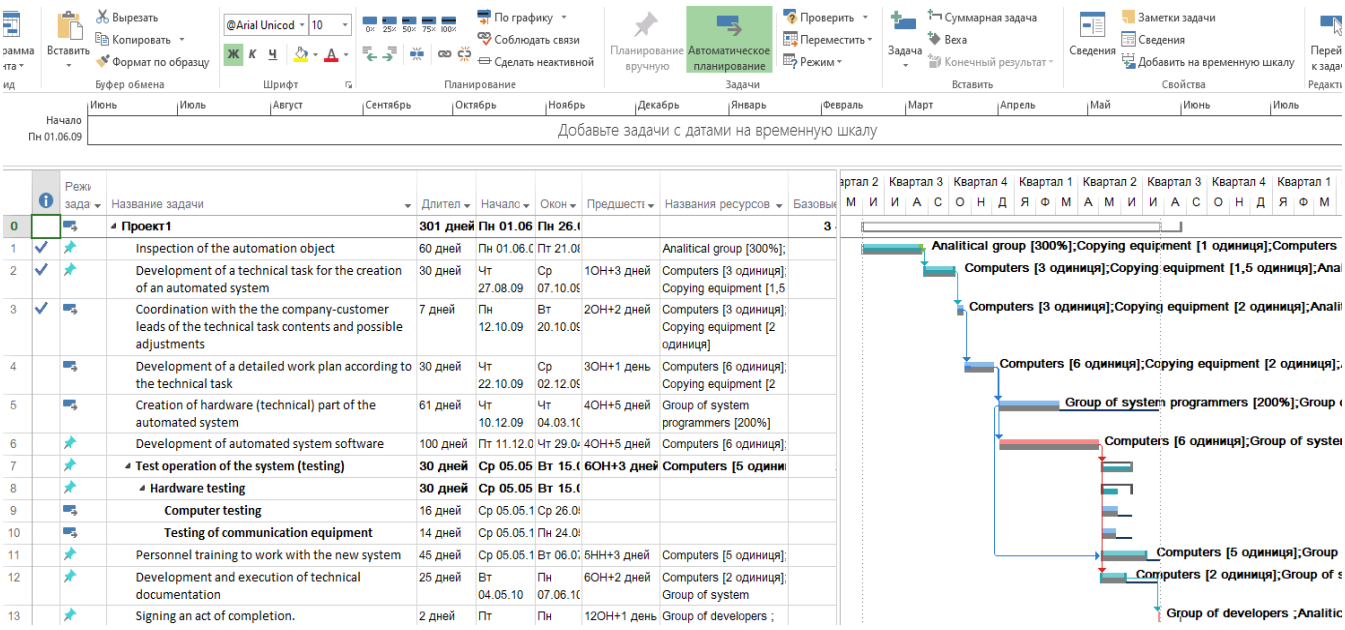

Fig. 3. Presentation of the project in WBS form and Gantt chart within the case [designed by authors]

The key stage of successful project planning and its implementation is the planning of resources and fixing them on tasks, the duration of which was predetermined. In the role of initial data, the case contained certain assumptions about the types and quantities of available resources (renewable and non-renewable, i.e. human, material, financial, etc.). Students were asked to distribute conditionally available resources between previously planned types of work in their opinion. This task was performed in small groups, the results were discussed in class, there were foreseen the possible risks and the existence of periods of unavailability. However, adjustments were made only after entering data into the MS Project.

This stage of work considered extremely important and productive in the process of acquiring a number of competencies. First, the program made possible visually identify problems with resources (the student could see his own imperfections of pre-planning without undue criticism). Secondly, thanks to the tool "Task Scheduler" it was possible to make changes to the project on the program's proposal, or to adjust the number and schedule of resources. This was especially true of human resources. In general, the task was to try several options for change, assess their impact on the duration and cost of the project, make decision and justify it. Here, each group again had the opportunity to implement a creative approach, carry out a brainstorm, and deepen knowledge of the program's functionality.

The next stage was a logical continuation of the previous one: identification and accounting of project risks. As the project had at least two or three options for decision-making in conditions of risk and uncertainty, it was proposed to analyze existing types of risks, consider several scenarios of project behavior at different stages of the life cycle, to determine the critical path of the project.

The atmosphere of competition, interest in learning, the desire to cope with problematic situations prevailed in the classes. It was the culmination moment, the software acted as a teacher's assistant, solutions founded with its help.

The last part of the work with case was more technical, because after the allocation of resources by operations, determining their duration, critical path, it was possible to calculate the cost of each operation and project, it has become possible to make certain reports on control dates and move to the final stage. In the end it was necessary make the financial plan of work with the project, think over contracts, the wage and project financing systems.

After the completion of the case, the results were summarized and evaluated. Each team prepared a short satisfaction summary of their own results, recognition of those moments that caused the greatest difficulty and ways to develop knowledge and practical skills for the future. There were no winners or losers in this work, because the best reward is satisfaction with the transition to a new level of knowledge and awareness, moments of insight and establishment of better interpersonal communication, recognition of work by other team members, groups.

Student performance under the case method assessed from various aspects and included classroom participation, individual exercises in the MS Project environment, group activities such as participation in discussions and presentations. A significant part of the student's assessment (about 50%) was participation in classes, independent work (30%) and passing the final exam (20%).

After the work done, the student has the opportunity to assess his own strengths and weaknesses, what in the future will affect the formation of professional interests, individual learning trajectory in continuing education.

4. CONCLUSIONS

Summarizing the experience, the authors consider promising areas for improving the case study method in the field of IT project management, which is today a powerful source of innovative technologies in project management based on modern software, including cloud technology.

When studying by the case method an atmosphere of constructiveness, finding solutions and solving problem situations are being created. Unlike traditional teaching methods, students train in information skills of searching and processing of information, situation analysis, generalization, teamwork and leadership skills.

According to the results of the survey, which is conducted after each school year, satisfaction with the chosen teaching methods was 85% of all respondents; 78% were satisfied with their own knowledge. Quite a large number of students showed a willingness to continue working as IT project managers in the future. Almost 70% are ready to make design elements when writing final theses.

Given example demonstrates the inexhaustibility of ideas in the development and implementation of a case method in the field of combining IT project management and information systems.

Work on the cases creation contributes to the professional development of the teacher, expands interdisciplinary skills, and provides valuable material for pedagogical experience and skills.

In further study in the master's course, the authors consider promising areas of application of the case method in the study of various IT project management software, such as Jira, Trello, Canban in combination with agile SCRUM technologies for project work and other learning technologies related to modeling of professional situations.

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