TRENDS IN THE DEVELOPMENT OF IT PROJECTS' MANAGEMENT

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Abstract: The main aim of this study is to analyse the development trends of project management with the focus on the management of IT projects. The initial parts of the work are devoted to the analysis of the concepts concerning project management and their relation to the management of processes. Next, the author defines the basic determinants of IT projects' management. The subsequent part of this work concerns the evolution of the IT project life cycle in project management methodologies. In the final part of this study the author characterized modern project management methodologies and analyzed the trends in their development.

Keywords: Project management, process management, methodologies of IT project management, the evolution of project management methods

Introduction

For In the classical form the term *project management* appears in two possible semantic ranges, with narrow and wide definitions.
In the narrow, practical sense *"...it can be defined as a set of managerial activities related to the implementation of the projects and a set of principles, methods and means used in these operations..."*[28]. *"...Traditionally, project management is viewed as planning, scheduling and controlling of the project aiming at achieving its objectives..."*[5] This represents de facto *"... an integrated and unique collection of information and decision-making activities performed to achieve the required range of specific project goals, limited by available means, carried out according to specific methodologies applied with their assigned techniques used to realize specific tasks..."*[6]. Integrated - because it must lead to achieving the objectives of the project. Unique - as it results from the uniqueness and distinctiveness of the project tasks. Here, methodology appears as a kind of tutorial, a collection of guidelines and rules for presenting what should be done at a given moment in the project, but not showing how it should be performed. Methodology is perceived as a system of tools, procedures, general techniques which allow the formalization of the project and answering the question of how to achieve the objectives of the project. Specific technique – clarifies the term *methodology* and refers to a set of tools, by means of which methodology is being implemented.
From a broad, theoretical point of view this is a specific field of science, based on theoretical solutions of practical problems arising „... *from the need to satisfy the analyzed customer's requirements with the use of available skills, knowledge,*

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methods, techniques and implementation tools…"[19]. Thus, this is a study concerning the effective achievement of the assumed objectives by means of a rational use of resources (human, financial, material resources, etc. and relations between them) within the projected timescale. What is typical of this scientific field is its variability connected with the dynamics of economic environment. If it is to be a response to current economic problems, it should always be adapted to the possibilities of solving them. And that is not necessarily consistent with the classical understanding of the concept of project management and, as we observe, it appears to evolve into the direction of process management.

It results from the fact that the subject of project management and, simultaneously, its main component in all the above definitions is undoubtedly a project. There are many very similar and non-contradictory definitions of projects, where the main characteristics of the concept are highlighted. Authors agree on the definition with regard to the content, and only later in the cycle of project implementation they postulate the requirements which cause the fact that their approach to the project seems to be somewhat different. Nevertheless – irrelevant of individual definitions – the essence of the project is an efficient and methodical execution of a particular project. Project is understood as a complex sequence of not necessarily sequential and complicated actions, carried out according to the adopted plan. It follows that the project is innovative, unique, complex, group, coordinated enterprise which has a fixed timeframe and limited financial resources and it is aimed at achieving a specified objective, with a predetermined range of often strategic and generally high quality requirements. The project is realized with specified methods and techniques contained therein, applied with full premeditation or in an intuitive way, usually according to a specified schedule, following a cost estimate established for particular stages according to the documentation required by law. The scope of this concept is still very wide – from the creation of new objects (things, goods, information sets), modernization of existing ones, addition of new values or extension of previously defined objects, the elimination (replacing with new ones) of old objects or activities consisting of the combination of these operations.

Generally, the features of contemporary projects are as follows:

- purposefulness – activity aimed at achieving the results defined for the contractor or the ordering party. It should be noted that the ordering party sometimes becomes aware of new circumstances in the course of the project and demands modification of the project even beyond the framework set by the signed agreements, and therefore the adaptability to the changing goal may be important,
- complexity – of course, you can manage even a simple project with the focus on its correct implementation, nevertheless the activity is not so complicated to require special methods or executive techniques. Therefore, in general, the concept of the project refers to an enterprise which is complex enough for one person not to be able to activate the entire project and which creates a need to coordinate the functioning of many individuals, teams, organizational units and even organizations. The complexity, enhanced by technical and organizational

progress and rapid changes in the particular fields, often requires adjustments (through change) of initial project assumptions,

- uniqueness – a specific feature – novelty, conceptual and executive uniqueness, is treated in reality in a rather flexible manner. Sometimes an original object (with some modifications, or used in another field (industry)) is treated as a unique object. Therefore, we may describe some projects as standard and repeatable ones, where innovativeness and uniqueness consist in generating specific and unique parameters of the project created for a single customer. Implementation of the latter is much more expensive than standard, repeatable projects. Other interpretations speak of the specifity of one-off projects where we use the knowledge and experience gained through participation in previous projects in new projects,
- determinism – the definiteness in time (space), scope and budget. The budget, scope and timeframe are in specific mutual relations, limited by resources. Unjustified interference with that particular equilibrium (technical project triangle) influences the change of other parameters. Project management also includes risk management, risk under the conditions of uncertainty, etc. There are also special methods of resolving these issues. We need to be aware that in the economic reality there are relatively few clearly defined situations, and in managing projects we refer only to determined models of generally random events, carrying a certain amount of risk. Projects, especially large and innovative ones, usually exceed the forecast schedule and the expected budget level, and do not keep within the scope of activities; therefore, the risk connected with their implementation is relatively high. In recent years we started to pay attention to the fourth ingredient – the requirements of the end user (the ease of use of project solutions, high speed of obtaining the final result, the accuracy of projections – even at the expense of partial deterioration of quality and obtaining the acceptable results instead of optimal ones), which greatly increases the area of manipulating of the variants of project implementation,
- risk – connected with the difficulty of implementation – since it is usually a complex, complicated, innovative enterprise and, as a consequence, burdened with high costs, there are many factors that can interfere with the normal cycle of the project implementation. Moreover, methods and techniques which support decision-making processes occurring in project management are often based on models, i.e. a specific simplified reflection of economic reality. If this reflection is incorrect, the implementation risk increases despite the mathematical excellence and testability of methods and techniques. Even in the case where only one of its initial assumptions is not realized, the usefulness of the final result proves very doubtful. However, it seems that for the decision-makers, even such approximate information has greater value than the lack of it,
- autonomy – the total (e.g. outsourcing in its various forms) or partial independence of from the contractor's/customer's organizational structures. It usually means a separation of project operations from routine organizations' tasks.

The concept of non-routineness thus permits the form of a project which is being implemented within a particular organization, even though its complexity would indicate the necessity of the realization also by means of external forces and measures.

Summing up – in the classical term, project management is a unique, individual project undertaken in order to create a quantitatively and qualitatively defined unique product or service, using the allocated human, material and financial resources, limited in time by clearly defined starting and final points, which are connected by particular implementation stages.

- at present – as the foregoing considerations point out - determinism, uniqueness and statistics in determining the characteristics and results of the projects move towards probabilistics, indeterminacy and dynamism. Theoretically – the discrepancy between the two basic kinds of action distinguished in a contemporary organization: projects and processes should increase. Still, projects are defined as unique, individual projects, which require proper preparation, while the processes are repeatable and may be automated or they may become a routine activity. The main difference is the fact that the processes are being conducted all the time and they are inherently repeatable, while projects are being realized whenever a new need arises, and each project is different. However, in principle, in a sense, projects are subsets of processes – these are all processes that can be described as non-routine (change-directed) ones, innovative, pragmatic, burdened with high risk and unique (ref.: Fig. 1). This is due to specific similarities – both activities are carried out by selected teams by way of planning, controlling, monitoring particular actions, determined by specific resources limited in time.

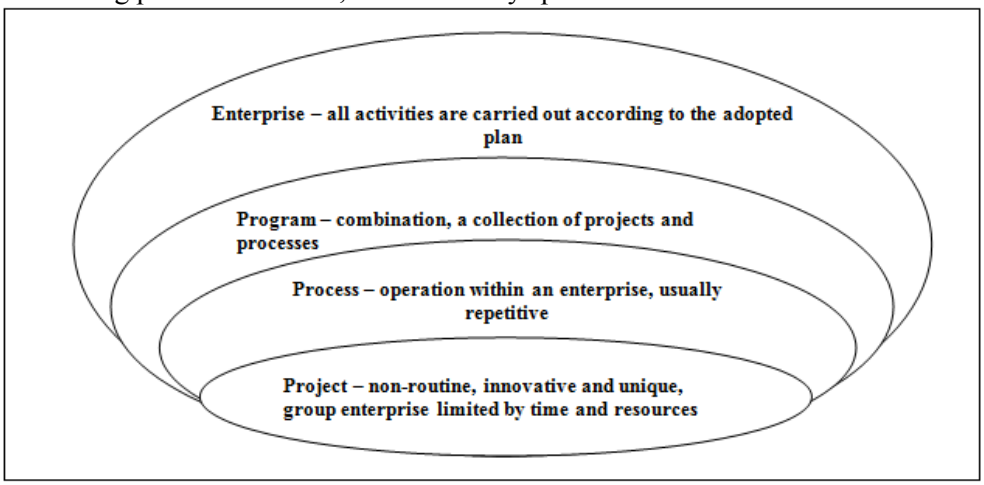

Figure 1. Relations between projects, processes, enterprise and program
Source: the author's own work

This, in turn, causes the fact that changes in process management directly affect project management. Projects are carried out in order to improve existing processes, creating entirely new processes and solving specific problems connected

with the necessity of process changes. In every organization there occur both process and project actions. Contrary to its classical definition, projects generally do not end. Every end of one project starts the beginning of the next one (e.g. in IT: pre-implementation work, implementation work, etc.), in total they are sometimes an endless cycle of projects which we cannot even call subprojects, because we never know – due to uncertainty and high risk – the directions in which the requirements of end users would develop. However, the most symptomatic for the project development is that, in fact, the methodologies of project management were created, generalized, "fixed", codified, etc. in order to best normalize processes occurring in the project. The paradox – as we may see – consisted in the fact that they were closer and closer to the process management methodologies, they were aimed at operating standard rules of solving non-standard problems, which they sought to standardize (or change into processes) by a far-reaching formalization. One may be under the impression that the distinction which occurs in literature (ref. Tab.1.) savors of artificiality and does not reflect the reality.

Table 1. Similarities and differences between projects and processes

Project	Process
Dynamism, change management	Stability in the sense of repeatability
Uniqueness	Routine
Pragmatism	Automatism
Change management (revolution)	Modifications (evolution)
Non-implementation risk	Low risk
Innovativeness, novelty	Traditionalism of conduct
Involvement of management	Lack of influence of management on the processes
Conflicts in the organization	Cooperation in the organization

Source: the author's own work

Sometimes interchangeably with the concept of a project, we apply the notion of the program either as a project in non-commercial areas, or as a bundle of projects (a very complex, expensive, risky, complicated project, etc.). For some time the definition of a program has been evolving in the direction of "*…a structured set of interrelated projects, which are both desirable and necessary, as well as sufficient to achieve the business goal and to deliver the value expected by the sponsor of the program…"*[20]. Programs consisting of many projects, in contrast, are not limited in time. Therefore, it might seem that one of the directions of the development of projects and project management may be programs. Perhaps the problem lies in the maladjustment of narrow limits imposed upon the classical term of project in relation to the theory and practice of project management?

Determinants of effective management in IT projects

In the traditional project management, it is considered that the basic determinants of the project are time, costs and scope. The time of implementation is the result of specific "attachment" to the typical methods of solving problems occurring in project management, where the establishment of the beginning and the end of the project was a necessary condition for obtaining the results in the applied methods (especially with regard to the networks). The costs of the project are connected with the available resources and the scope and limitations related to a particular field to which the project relates. The three listed elements constitute the so-called "golden triangle" of project management, in which particular parameters are connected by the so-called equilibrium equation. The area between the vertices of a triangle defined by time, cost and scope contains the solutions which are acceptable for the contractor, but they are not optimal ones. Extreme values are established by means of a combination of the values of the triangle vertices. In this way the determination of the two values results in the fact that the third one is the total: a change of one of them results in the necessity of changing the remaining ones. Thus, shorter time of implementation means higher costs or reduced scope of the project. Increasing the scope may raise the costs and/or extending the time of realization. Reducing costs will generally result in reducing the scope and extending the implementation time.

On the other hand, extending the time of realization does not necessarily mean reducing costs or increasing the scope of the project. The causes and consequences of the lack of reflexivity of these relations depend on the final recipient of the project. Therefore, there appears a postulate to include another, fourth parameter – the requirements of the recipient[1]. This approach increases the range of available solutions as well as the number of potential combinations of events which may occur in the course of the project implementation. This explains a number of phenomena occurring in the course of the implementation of the projects in the economic reality.

The research conducted in 1994-2009 by Standish Group International which concerns the assumed realization of the projects show that the success rate in such enterprises remained at 16%-35% (ref.: Tab. 2). Of course, the high rate of failure is due to the adoption of a rather restrictive assumption that failure is any deviation from the basic parameters of the project (e.g. exceeding the budget, failure to meet deadlines, failure to execute the scope of work), but still the percentage of failure is remarkably high. And, unfortunately, it does not decrease with time – despite technological progress, it still remains at around 30%.

[1] We also observe the attempts to add quality parameters, sometimes associated with the workload and the risk associated with the projects; however, in this section it does not seem justified.

Table 2. Average scale of project realization analyzed by Standish Group in selected years in the period 1994 - 2008

Year	Success rate	Failure rate
1994	16%	84%
1996	27%	73%
1998	26%	74%
2000	28%	72%
2002	34%	66%
2003	33%	67%
2004	29%	71%
2006	35%	65%
2008	32%	68%

Source: the author's own work on the basis of [16, 24, 26, 27]

Rate were, then among the factors affecting the difficulty in the project implementation we distinguish a set of soft parameters connected with the human factor – they constitute up to 40% of all determinants of failures classified in the first ten, both in 2000 and in 2008. Strictly technological factors are 50% fewer and they are in worse positions in the classification (ref.: Tab. 3).

Table 3. Factors affecting the implementation of the project

	Factor affecting the implementation of the project	Percentage of responses	
		Ranking 2000	Ranking 2008
1.	**Lack of involvement of business users and information from them**	2	1
2.	Incomplete business and functional requirements or their change	6	2
3.	**Inexperienced project manager**	4	3
4.	**Lack of support from the company's management**	1	4
5.	Lack of technological competences	5	5
6.	**Lack of resources for the project implementation (human resources)**	8	6
7.	Unrealistic expectations of the implementation team	10	7
8.	Vaguely defined requirements (goals)	3	8
9.	Unrealistic project schedule	9	9
10.	Frequent and radical change in technology	7	10

Source: the author's own work on the basis of: [16; 24, 26]

Another approach to the factors determining the implementation of the project is a report entitled *The Silence Fails*, which is a summary of research conducted by

VirtalSmarts training company and The Concours Group, which presents five critical areas that have the greatest (according to their respondents) influence on the success and failure of the projects [9].
Project managers identified and characterized five critical areas representing the greatest obstacles with regard to achieving success [11]:

- Incorrectly conducted analysis of the project requirements – caused by the lack of interviews and discussions with the contractor on the experience drawn from previously conducted projects, which may be used in the current project, at an early stage of project implementation. In general, the first meeting of the project team starts a discussion over an already constructed timetable, with fixed resources and settled deadlines of their utilization,
- Lack of support on the part of the sponsor of the project – the client is trying to get involved to a minimum degree in the project implementation. Lack of the cooperation results in imprecise information and incorrect organizational diagnosis, on the basis of which it is difficult to create correct specification of solving the problem and modeling the processes which would lead to it. Projects are more and more delayed, or/and they do not meet the requirements of the sponsors. These problems may be avoided through regularly organized direct meetings of the contractor with the client,
- Lack of knowledge about the state of the project – hiding the problems which occur in the team from their superiors for fear of their reaction and attempts to solve them on their own or omit them, passing on the information about critical events in the project on other team members,
- Avoiding responsibility for the priority tasks of the project – starting the implementation of the project (against the schedule) from the easiest and not necessarily the most important tasks in the project, ignoring at the beginning the most difficult tasks, and the priorities which carry a risk of failure. It may lead to the lack of coordination across the entire project,
- Shifting responsibility for the tasks that the team members are unwilling to take or they are unable to perform due to the lack of knowledge or lack of practice. Creating artificial barriers (…it is impossible, it is unprofessional, it will cost a lot…), to allow the transfer of tasks to others, or even abandonment of the tasks.

The presented study shows that in the case of the lack of analysis and proper reaction to the above situations in the project which is being carried out, the probability of the failure of the project (defined as exceeding the adopted budget and timeframe as well as the failure to meet all the client's requirements with regard to the scope, quality and functionality of the product created) increases to 85%. However, if a remedial action concerning "critical areas" is successful, then the chance of failure is reduced by 50-70%.
On the basis of its own study, the Standish Group [24] has published ten key factors contributing to the success of the project:

- Customer's involvement in the project implementation,
- The support of the management (sponsor) of the project,

- A clearly defined business goal of the project (specified requirements with the consideration of existing limitations),
- Optimized scope of the project (adopted to the possibilities of performance),
- Agile development methodology in place of a traditional one,
- Experienced and qualified project manager,
- Proper management of the budget of the project,
- Educated human resources,
- A formal methodology for the project management,
- Standard software tools and infrastructure.

Among them, a similar percentage as with failures depends on the human factor, and only 20% relates on the technology-related factors. Generally, this indicates that technological progress seems not to have such a great influence on the realization of project management, as the funds involved in its development might suggest.

For these reasons, the notion of success at present evolves towards the assessment which goes beyond the classic, narrow triangle of balance between costs, time and scope. We adopt here the recipient-user's point of view and his/her way of seeing the project, both in internal projects (in which both individuals implementing the project and its customers are employees within the same organization, and the final product of the projects stays within the same entity), and in external ones (products made for customers outside organizations and are a source of revenue they generate). The mere extension of "golden triangle", with the fourth parameter will also expand the opportunities for making decisions regarding its realization (every decision is already described by four ordered parameters (time, scope, costs, requirements), and not three as previously). While the relationships between parameters are – it seems – non-equivalent, the requirements of customers are superior in relation to other parameters (ref.: Fig. 2). It appears that the surroundings' (environment's) impact the changing relations between project management and process management. The environment in which projects are realized is divided into [28]: economic (prices, tariffs/customs, taxes, exchange rates, interest rates, economic policy, markets, the degree/stage of economic development), legal (legal system, its adaptation to the conditions of implementation, licenses), technological (technological development, the state of technology in the organization, quality standards), organizational (organizational structures, management style, skills and knowledge of management staff and employees, functionality of the organization, method of project management), psychological (culture, resistance to change, degree of innovation, implementation and execution security) and political environment (geopolitical conditionings, development trends, alliances, fashion).

At this point there appears another important issue. The success of the project in the classical approach and the success of the project in the contemporary approach (and its management) based on practice are significantly different. In the classical view (and this is the approach taken by many studies) the success (particularly

performance) is not exceeding the costs, full compliance of the schedule with the execution deadlines and the compliance of the work performed with the tasks specified in the project.

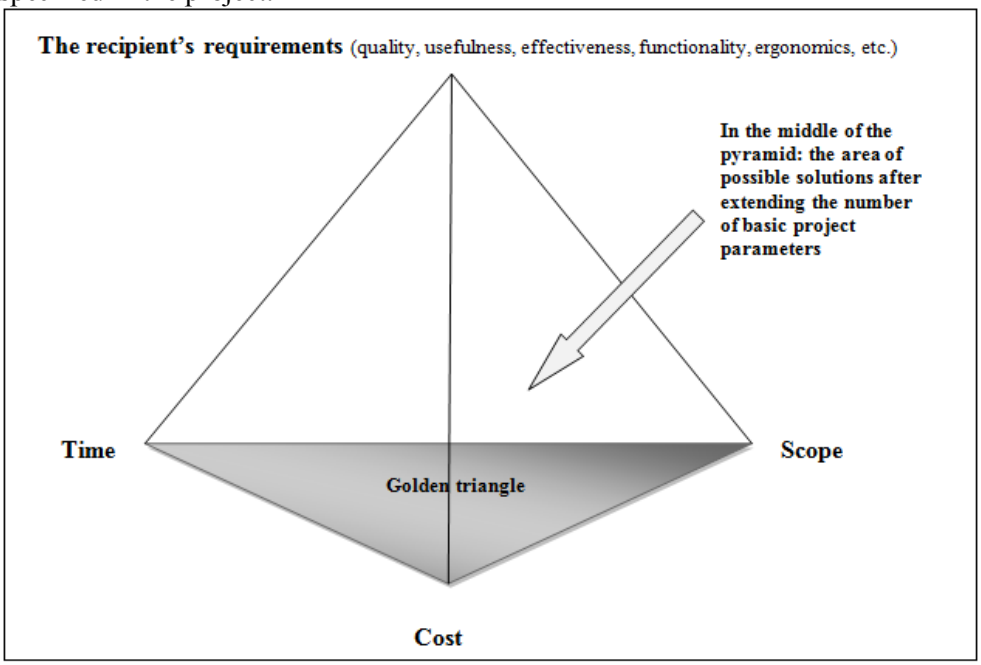

Figure 2. The area of feasible combinations of the basic parameters of the project and its extension

Source: the author's own work

Including the point of view of the user (recipient, customer) means adding the evaluation of success to other criteria: the issue of client's satisfaction with the obtained product of service. Including the dynamic environment, in consequence, means reducing the risk of failure, efficiency, effectiveness, flexibility, adaptability, functionality, etc. And the evaluations are very close to the evaluation of success of proper process management in the organization. The analysis of the findings obtained by the Standish Group points to very practical determinants of success. The result of project implementation in the common perception may be radically different from the one which results from the classical approach. On average, almost three quarters of the projects in recent years exceeded the costs, missed the deadlines or did not perform the workload and still they were considered a success, both on the part of the contractor and on the part of the customer (client, recipient, user). During the interviews, they claimed that the most important thing for them was the fact that the project has been implemented and that it was the basis for further action (often starting a new project or its modification). Another situation might appear when the project which exceeded the costs and the schedule has been considered a success due to the realization of the

increased range, and another project has been considered a failure even though the two parameters i.e. costs and schedule have been kept, and the scope has been exceeded. Obviously, sometimes there are situations where the contractor's evaluation radically differs from the customer's assessment, but increasingly it extends beyond the canon of non-compliance of the three basic parameters. If the management of the project is successful, it does not mean that the project was successful; however, it might mean that the success was the proper timing of a departure from the project assumptions (change management). At every stage of the project planning and implementation such an enterprise may be seen by some stakeholders as a chance and by some as a threat.Therefore, we may observe here inter-organization games which have their beginning even before the project starts (e.g. concerning the issue (preliminary definition), whether the project is needed at all) and may not stop even after the project is completed (the game is whether the project will be considered a success or a failure).

Nevertheless, a sample list of criteria may – taking the above comments into account – have the following form [13]:

- Achieving the project objectives,
- The satisfaction of a client, recipients (users), contractors,
- Compliance with the schedule (e.g. at the level of the entire course of the project, at particular stages, project completion in relation to the proposed changes and modifications),
- Compliance with the costs (e.g. in relations to particular items, groups, keeping within the budget (savings) or exceeding the budget in certain situations,
- Compliance with the scope of activities (e.g.: keeping the assumed scope of the project, performance of the most important elements or planned tasks, agreed decreasing or increasing of the scope of the project),
- Conformity with the requirements: (e.g. reaching a higher level of effectiveness, acceptable functionality or usability, maintaining quality at a certain level (agreed, normative, comparable, etc.),
- Product or service successful in the market,
- Appropriate risk management (e.g. minimizing the risk, adequate response to an unforeseen situation).

Another problem which always appears in the evaluation of projects is a preference scale in relation to particular criteria. At the moment of adopting the assumption that we have more than three equivalent (and balanced) criteria (as it was in the case of the classical theory), then in the case of equivalence of criteria we may have difficulty determining whether a given project was actually successful or not. We can then either agree with the stakeholders of the project with regard to the issue of which of the criteria (and to what extent) are the most important to them or apply one of the relational methods (e.g. compromise methods – AHP/ANP T. Saaty types [21]) or functional (e.g. multicriteria methods) in evaluating them.

The traditional life cycle of IT projects' management and the implications of its realization

Project management in the classic form has been defined as "*...the application of knowledge, skills, tools and techniques in relation to the activities realized in the project, complying with the realization of the requirements of a particular project. The application of knowledge requires the effective use of appropriate processes…"*[1] Process in this case means a set of interrelated activities undertaken in order to obtain specific products and services. It is characterized by its associated outlay, resources, time, implementation tools and expected results. The uniqueness of the analyzed and modified processes is to consist in the so-called organizational assets containing the principles and criteria of adapting the processes to the specific needs of projects. Generally, the processes may be divided into two groups:

- organizational processes which ensure the efficient conduct of the project (how?, in what order?) – the sequence of actions, operational variants, can we conduct the activities in parallel?
- object-oriented processes which allow for establishing more precise conditions of the implementation of the project or service (what?, in what way?, using what techniques?)

The processes are intertwined with each other at successive stages of the project, and they may occur simultaneously and come in numerous interactions. Standard PMI [1, p.41] characterizes project management through the prism of mutual interactions between the processes and within the processes, and also through the perspective of the purpose they serve. The processes were classified into five groups, which are subsequently realized in the next phases of the project implementation as the projects are being implemented according to a certain specific order of activities performed by particular project teams. This model of sequential and parallel realization of the project tasks in the specific time and/or locations, with limited resources we call the *life cycle of the project*, and the term corresponds to the life cycle of a biological object from birth (the initiation of the project), to death (the end/completion of the project). It is de facto a representation of the process of real actions in the course of building an object or a process, taking into consideration the different phases of the cycle in the previously described or recorded canonical form, or properly adapted because of the circumstances disrupting the established pattern of conduct, resulting from the need of adjusting to the needs of a specific organization (based on the knowledge within the organization) or adapting to the consensus worked out by the contractor or customer, or imposing solutions arising from the requirements of the client's organization (based on their own judgment of the customer's requirement).

Usually in a life cycle we distinguish particular phases, some of which may occur sequentially or in a parallel manner, once or many times. We may distinguish the following methodologies in creating life cycle models:

- classical (traditional, heavy) such as e.g.: cascade (linear), incremental, evaluation, database, prototype, spiral methodologies,
- modern (agile, light) – such as e.g.: XP (eXtreme Programming), Scrum, Feature Driven Development (FDD), Dynamic System Development Method (DSDM) or Adaptive Software Development (ASD) [more: 6].

In the classical cascade approach we distinguish five basic phases (ref.: Fig. 3), common in terms of concept also for other traditional methodologies [7]:

- initiating and defining projects,
- identifying the structuring projects,
- planning the course and resources of the project,
- controlling the course of the project,
- closing the project.

The phase of initiating and defining the projects consists of three basic stages: initiating the project, defining the project and organizing the project team. Initiating the project includes the analysis of the needs and requirements of the customer, together with the articulation of the initiatives of the undertaking the project and submitting the initiative to the management circles (unless they are the authors of the enterprise); next the evaluation of the initiative and its acceptance for further implementation, its rejection or modification. Defining the project is a stage where the clarification of the initiative in the sense of specifying detailed objectives, which will be realized owing to the project, identification of the project risk (through analysis and evaluation), a preliminary estimate (sometimes a variant one) of costs, outlay and effects connected with the adoption and implementation of the project – and iteratively – the adoption, modification and rejection of the defined project. The last – but nevertheless an important step – is to establish a project manager and the project team. First, we determine the institutional and organizational form of realizing the project. After making a decision, we appoint the project manager and the project team. The manager of the project is a person who has the greatest influence on the initiation, implementation and the final result of the project. He or she directly participates in the process of project management through coordination, motivation, elimination of problems and minimization of risk. Also, the project manager has a considerable impact on obtaining the optimal composition and organization of work (including a timetable) of the project team.

The next development phase is determining its structure. It consists in further clarification of the project objectives, which in the initiation phase might have been ignored or underestimated. This usually requires additional information concerning the user's requirements (on the part of the client), and subsequent structuring of the existing assumptions. Due to the regularity of project implementation – especially in the case of complex and innovative projects – we determine the criteria for dividing the project into its constituent parts and we determine its vertical and horizontal structure. In the course of determining the structure of the project, institutionalization of the form of project management takes place. It means the scope and the way of connecting the project's organization with the structure of an

enterprise in which the project is being carried out. It consists in selecting such a structure which would ensure the most effective implementation of the project out of a variety of management structures (e.g. linear, linear-team, matrix, project, separate-project, internal realization structure, etc.). The institutional form of project management is enforced by the problems which arise in connection with its realization; therefore, we cannot pre-determine the best institutional form: at times it is being modified during the implementation – new elements are added, e.g. appointing an additional team of independent experts in the form of a management team of the previously established structure. Dilemmas concerning the scope of functionality and competence of the established structure emerge– whether the organization should be focused primarily on the realization of the current tasks or the project implementation. Undoubtedly, with various institutional forms the problem of coordination and the instability associated with it is different. The created structure also depends on the size of the project, degree of its complexity, and its scope of innovation (also the costs associated with it, which are not yet settled, yet already borne in mind, because they were initially set out in the first phase of the project).

The third phase of the project is planning the process and resources of the project. The project plan should contain the specified main purpose and the sub-goals resulting from it as well as associated tasks in the structural division established in the previous phase, delegating contractors and sub-contractors to perform the tasks, as well as setting the time of realization of particular project tasks and particular activities performed within the tasks (if it is required for the sake of the entire project). In order to ensure the implementation of tasks and activities in time, the work schedule is drawn up, and in the schedule we also mark the critical moments of the project (milestones) and points of verification (monitoring of activities (together with criteria), the acceptance of work (receipt principles), transfer of work to the user). This also reduces conflict within the project team as well as the conflicts of the project team and the organization for which the project is being realized, and it reduces the risk of failure. Planning the resources of the project is particularly important for this phase. This action consists in estimating physical resources of people, materials, raw materials, tools needed for the project and the proportion (sometimes in the form of a normative) of their use for specific tasks (sometimes in the form of alternative substitutes). Subsequently, an estimation of costs – physical resources - is being performed – their compilation in the form of their value and the documentation of such estimates. As a result of the assessment of costs, a cost management plan appears, and the cost management plan should also include principles concerning dealing with implementation deviations from the initial project assumptions in this regard. In order to realize the plan, the so-called budgeting – i.e. assigning the anticipated costs of realization to particular plan elements - is being performed. The distribution of projected costs over time allows further comparison with the current costs and possible corrective actions in case of

any deviations. After accepting the planned actions and resource plan a decision is to be made on the further implementation of the project.
The estimates for this phase are made on the basis of a number of additional techniques such as: analytical technique, analogy technique, techniques of parametric evaluations as well as correlation evaluations, evaluation techniques and scoring evaluations as well as functionality assessments (e.g. software systems).
Another phase of the project life cycle is controlling its course. Basically, it consists of three interpenetrating stages: organizing the project execution, coordination of the preparation and realization as well as monitoring and control. The basis of the activity is the previously prepared plan of the course of the project. In order to realize it, we need to obtain the funds for its implementation, prepare the delegation of project tasks, "secure" suppliers, negotiate and make arrangements with subcontractors, contract the necessary supplies and services, develop appropriate motivational systems and strive to achieve proper quality of the project execution. In the process of implementation the coordination activities take place: deciding upon the terms of the performance of work, resource consumption, costs, risk, quality and cooperation between the members of the project team. Indispensable elements of this phase are the control of: the deadlines for task completion, resource consumption, the amount of incurred costs, timeliness of deliveries, minimization of implementation risk, ensuring the proper quality and the work of the project team and its cooperation with the organizational environment. As a standard reference we may use the quantitative and qualitative results, timeliness (meeting the deadlines), resource consumption (including: financial resources) and increasing the risk obtained at various stages of the project.
The final phase of the project process is project closure. Activities in this phase include the preparation of the final report on the project implementation, gathering views and reviews on the course of the project (if required), transfer (receipt) of the project to the customer, the final settlement of the project results (what was successful, what was not, what has been realized in a different way than planned) and making final arrangements with regard to the after-project activities (maintenance, modification mode, etc.). A further step is to decide on the project completion and disbanding the project team (or transforming it into a team supervising the proper functioning of the results of work done during the project).
Processes in particular phases of the project need not to follow sequentially, but they may be realized in parallel. In each phase particular processes are interconnected with the so-called input and output. Knowing the methods, tools and techniques of transformation of input values into output values, we may describe each process in particular phases of the project.

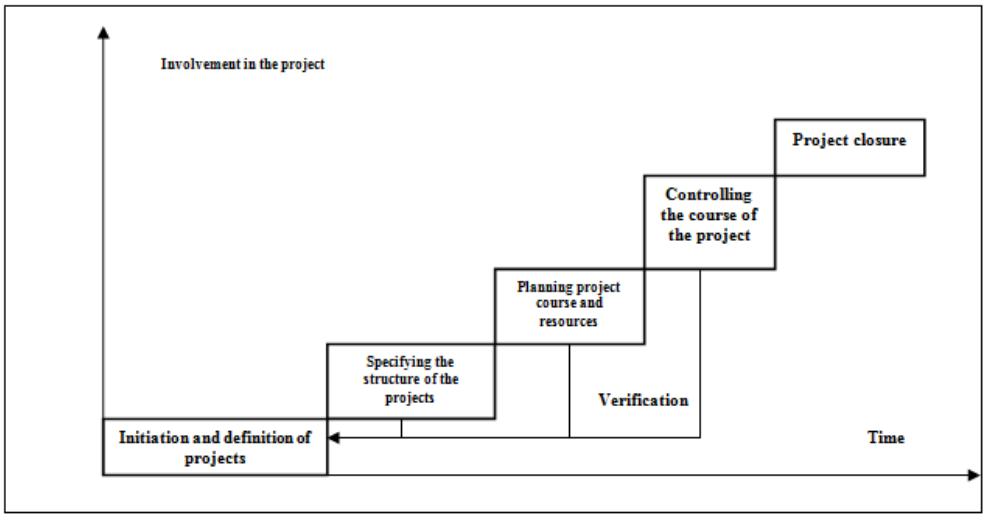

Figure 3. The main phases of the project life cycle in the cascade model
Source: the author's own work

In practice, there are projects which do not go through all the listed phases of the life cycle. In some of them a decision is made at a certain stage on the withdrawal from the specific, adopted methodology of the project implementation.
The cascade model is not the only one, but only the simplest model of the realization of the project life cycle. It does not include many problems outlined in the previous part of the chapter e.g. risk management. Its advantage is the simplicity of solutions and the fact that it has become the basis for other methodologies e.g. incremental or revolutionary methodologies. The most developed form of the traditional model is a spiral model.
The phases of the spiral model are as follows:

- establishing goals – it concerns the determination of specific goals and rationale for the concept and arranging plans for their implementation – construction of the model begins with the initiation and the definition of the project (setting preliminary requirements) and the initial risk analysis of the project; and on this basis the first prototype is built and the conceptual plan (schedule) of the total project is created,
- identifying and reducing threats – after the next phase of the risk analysis of the first prototype (identification of the most important threats, sources and ways of preventing threats) and exploring possible alternatives; another prototype of the project is built and the requirements concerning project limitations and resources are specified,
- creating and approving – at this stage there follows a process of the development of the subsequent part of the product, based on the most suitable model, selected on the basis of the evaluation of threats; subsequently an

implementation plan is drawn up and another stage is completed with the creation of the overall project plan,

- assessment and planning – this is a stage, where the work progress is being reviewed and the subsequent or final phase of the project is completed; the result of last circulation of the cycle are: the detailed project, tests and project implementation and its completion.

This model differs from the remaining ones due to its multiple repetition of particular phases of the basic model of a life cycle and – after each "subcycle" – there occurs the risk analysis which is completed with the success with regard to the feasibility of the whole system at the current moment of the development (ref.: Fig. 4).

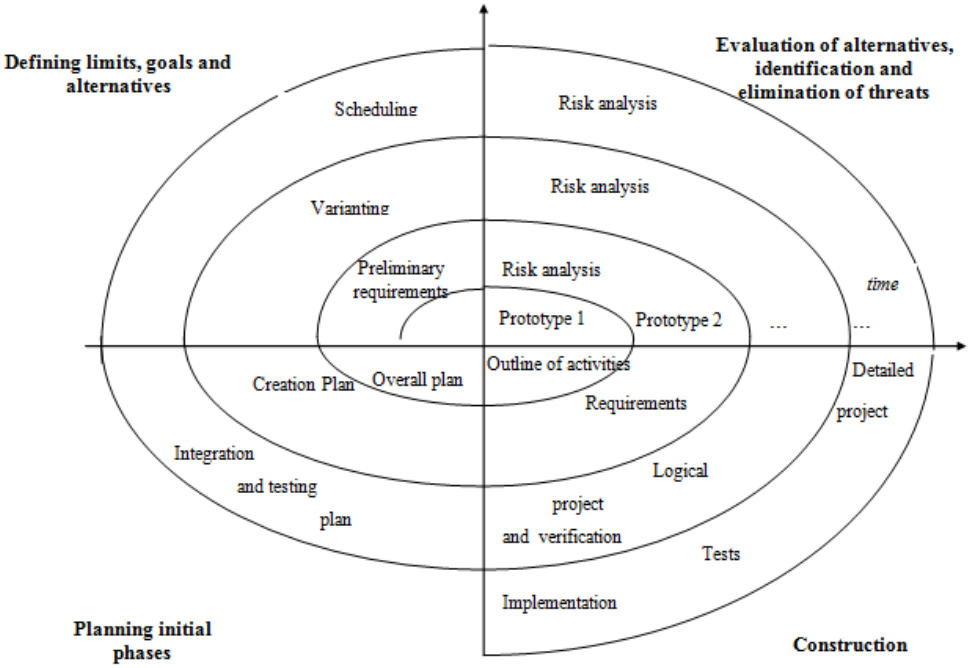

Figure 4. Scheme of actions in a spiral model of the project life cycle
Source: the author's own work on the basis of [4]

A group of traditional methodologies has existed for a long time. The regime, which they impose on the development of the project disciplines, in a sense, the course of the project implementation. However, this does not guarantee that the project will be successful. Methods are so "rigid" and structured that compliance with all the steps, formulas and procedures markedly slows down the whole process of the project development. The methods are characterized by the following features:

- predictable and repeatable approach towards the project development process – in classical methodologies we assume increasing specifity together with

the implementation of particular phases and stages of project development and covering the entire period from the beginning to the end of the project. Deterministic detailed techniques are generally used for analyses conducted at the very low degree of abstraction. The result obtained by means of the techniques is true until at least one of the initial assumptions will not be changed. Therefore, we assume deterministic, non-changeable, non-adaptable and rather inflexible schedule, budget and resources, and a full division of tasks for each team creating a product or service built on that basis,

- comprehensive documentation – the traditional approach towards the realization of the project assumes that the documentation is created after each phase, and frequently in the project life cycle. In the most conventional form of a cascade model we assume that the scope and user requirements are arranged and collected in the first phase of the cycle, and subsequently on their basis a product is being created and a service is being realized. The assumptions are not changed till the end of the project life cycle; part of the information and documents collected and converted into recommendations need to be changed in the course of the project implementation,
- process-orientation – the aim of classical methodologies is basically the definition of the process/processes which will be universal and repeatable, i.e. will be functioning in a proper way (and they will be useful to anyone who will be using it in any situation where they might be considered applicable). Each process, consisting of activities, should be carried out according to procedures set out in advance by a specific, assigned group of employees/ contractor responsible for it,
- orientation towards tools and techniques supporting implementation – we should provide the tools supporting management for the performance of each task specified in the project.

The development of the IT project management methods and the directions of their application

At the other extreme there are agile software development methods. Their basic aim is to maximize the value of the project in comparison to its current state, with the assumed costs and specified time. In *Manifesto for Agile Software Development* [3] we pay attention to the need for valuing more people and their interactions than processes and tools; operating result rather than vast documentation; cooperation with the client over formal arrangements and responding to change over following the plan. This corresponds to the demands mentioned previously which result from the evolution of views on the projects and their management. The main factor that differentiates the agile methods from the traditional ones is the recognition of people as the basic success factor in the project, which is connected with an intense focus on efficiency and incorporating changes [17]. It is also a specific response to business challenges, resulting from rapidly changing global markets.

Below the author presents the assumptions of agile methodologies, which may be treated also as the main differences from traditional methodologies of project management [2]:

- orientation towards the project stakeholders – according to those methodologies the most important factor connected with the project development (which is in line with the observations of among others Standish Group), the most important task for the team managers of agile projects is to draw the attention of people with specific skills such as: ambition, skills and mutual communication [14]. If people are not involved in the project, no process will repair their inadequacy,
- adaptability (unattainable *idee fixe* of traditional methods) – in this approach the emphasis is on change management. This encourages the user to transfer their knowledge more than the minimum expected in the project [25]. Change management involves a continuous response to constant changes in the project. The most difficult to assess and respond to are environmental changes because we cannot eliminate them: we should strive to minimize the costs associated with them,
- conformity with reality – we pay more attention to the conformity of the received results with the obtained project results, than the consistence with the initially assumed results (accordance not with the plan but with business assumptions).
- flexible scheduling – the basic problem of planning a project is the lack of possibility of foreseeing the implications of the development of plans of innovative enterprises (all projects should belong to this category), because environment in which they are created is highly dynamic. In agile projects, contractors need to consider how they may avoid the irreversibility of their decisions – enforced by the habit of minuteness traditional planning which leads to extensive specifity of details. Instead of trying to make the right decisions at the beginning of each cycle (traditional planning), it is better to take decisions in such a way so that in the next stages the decisions may be reversed,
- reliance on empirical processes – in traditional methods processes occur as deterministic and linear in agile methods as an empirical process (probabilistic, incorrectly or poorly structured), or a non-linear one. A deterministic process in which from the beginning to the end you can always expect the same results. Projects, because of their uniqueness, singleness, etc. cannot be defined as deterministic processes, because at the time of their implementation both the product and the project team may be developing. It is highly unlikely that any set of predefined steps lead to a desired, predictable result, because technological requirements and the people within the project team change,
- using a decentralized approach – a decentralized management style can significantly affect the project because it may save more time than an autocratic approach. In light methodologies we delegate some of the tasks connected to decision-making to all the team members.

- simplicity – in planning by means of light methodologies we always use the simplest route leading to achieving our goal – we assume easy model changes, which will be adapted to current needs and may occur at different times. We do not create greater functionality than that which is needed at a given moment, or the documentation which is trying to predict the future of the project. This reduces the focus on finding the information needed for the prediction [12],
- cooperation based on the cooperation with the customer (user) and internal cooperation – the client of the project should cooperate closely with the project team, providing all the necessary information and reporting current remarks and comments with regard to the project. Due to the decentralization, the executive team in agile methodologies should continuously communicate with each other.
- operation through small self-organizing teams – responsibilities and tasks are delegated to the team as a whole, and the team assigning them further, ensures their best implementation. In small teams the idea of continuous communication proves to be the best solution. The structure of the process and specific practices create minimal, structural framework for self-organizing teams. Their proper use significantly reduces the risk associated with the human factor.

As an example of light methodology the author presents the so-called *XP - eXtreme Programming* – methodology derived (similarly to other modern methods of programming) from economic science. This method was created basically still in the era of classical solutions, which evolved towards shortening of project development cycles, following the aim of incremental planning, continuous – during the various phases – gathering opinions, internal and external communications and unceasing evolution of the project [31]. Quick response to the changes in the project, alternately performed roles in the project (analyst, designer, project manager) and building the unity and strength of the team used at the extreme level in a common sense manner are characteristic features of the methodology.

The basic assumptions and recommendations of XP methodology are as follows:

- reversible planning – the contractors estimate the time required to perform the tasks commissioned the client, and subsequently the client specifies his or her requirements at the time, with subsequent adaptation to the time of implementation of these requirements,
- iterativeness – each application is created in successive iterations, each of them brings the planned version closer to final requirements
- the language of metaphors – creating a specific language (set, log), where each category has the same meaning for the contractor and the client,
- the simplicity of the architecture – the derived product should be as simple as possible, and complex proposals should be replaced by simpler ones,
- refactoring – restructuring of the system through eliminating redundant elements, improving communication or simplifying the model, without changing the complex functionality of the program,
- job sharing – alternate performance of the commonly assigned task, in

order to improve substitutability, mutual learning and plausibility checks, which improves the quality of the task,

- shared responsibility for the project – each team member may, at any time, change individual effects of the previous project results.
- Immediate and *continuous integration* of new fragments of work with the emerging whole and testing integrated solutions,
- Self-discipline expressed by assigning specific time to the project work of each team member and compliance with the standards with regard to communication, formal and substantive requirements established at the commencement of work,
- Maintaining regular contact with the client – the client requirement specifications based on the analysis are frequently ambiguous and incomplete. Therefore, it is necessary to revise them continuously through regular contacts with clients who verify the obtained results.

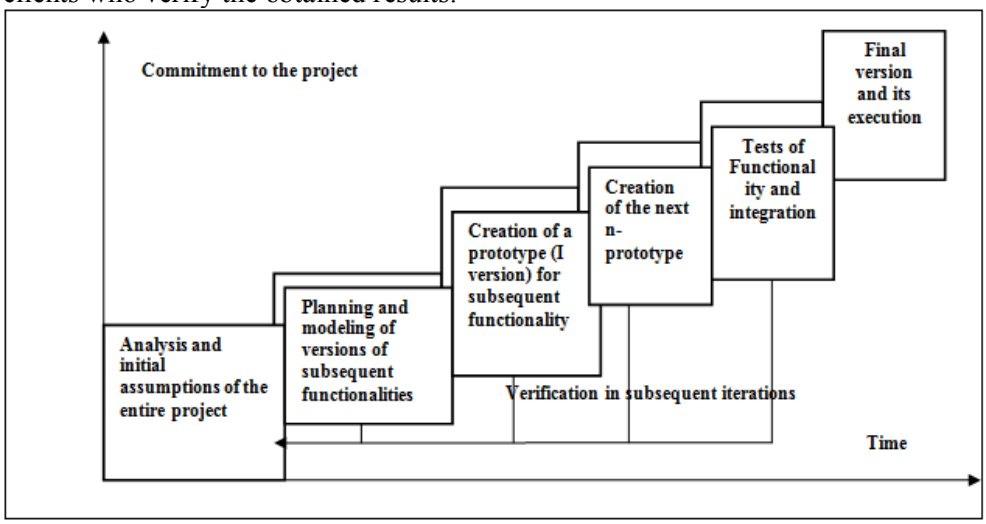

Figure 5. Basic phases of a project life cycle in the XP model
Source: the author's own work

The project life cycle according to XP model (ref.: Fig. 5), consists of six phases:

- analysis and initial assumptions – cost effectiveness analysis in the light of specified user requirements and limitations, the construction of the overall business structure and the tasks the contractor faces, the selection of the environment and implementation tools, contract negotiations. The stage common for the whole project, not always included in the methodology,
- planning and modeling of a version - presentation of a possible variant/variants of the project development for each functionality where we use the arrangements of the previous stage, dividing the project into the tasks presented by the clients and assigning priorities and placing them in the implementation schedule,

- subsequent iterations – the emergence of a prototype on the basis of a previous stage, presenting it to the client, introducing changes, creating another prototype, etc. and as a result – the creation of architecture and implementation of selected functions of subsequent versions,
- functionality tests – subsequent versions presented to the client are tested before next modifications, which at this stage may suggest, after creating the final version of each functionality, its integration with other versions takes place,
- delivery of the final version of a project and its implementation – the last iteration leads to the creation of the final, complete version of the project, which is then carried out.

Light methodologies have slight signs of completely universal features which may be used in every project. They may be applied only in certain types of projects, in specific organizations or industries. It concerns mainly innovative and dynamic projects where the speed, mobility and quality together are the key to success. It defines the strategic ability to create and respond to change, flexibility, adaptability, to trigger creativity and innovativeness in the creative team and leading an organization through change and the associated risk [18]. Simultaneously, it is an answer to a number of dilemmas connected with the direction of evolution of project management undertaken in this chapter.

The above analysis shows that there are many project management analyses and there is no single universal methodology. A methodology is a certain set of patterns, rules and formulas which help to avoid mistakes, but do not eliminate them completely. Despite the fact, the methodology which is being consistently implemented gives a sense of control over an enterprise, maintaining the full involvement of all the parties interested and justifies a sense of security of the realization of the strategy of the business sponsor.

Summary

The Therefore, more and more organizations which depend on the implementation of projects are interested in project management focusing in practice (simplifying the situation) mainly in parallel running of as many projects as possible. This allows the comparison of their characteristic features (schedules, costs, resources) realized for companies of different sizes, in many industries, in many locations. This allows for a multidimensional evaluation (including comparative, effectiveness etc. evaluation) of the ongoing projects and provides the project managers with the models of good management practice and the effectiveness assessment of particular organizational units running projects. Analyses of project implementation also provide evidence to share projects' resources (including technology, know-how, etc.), calculating the time and competence of contractors and the valuation of products and services generated in the project. Management by projects is a management style which improves entrepreneurship and is a specific "golden mean" between the customer's real needs (as determined by its specifity),

and the knowledge (theoretical and practical) and project management methods [23]. The pragmatics of the approach enables the creation of best practices in implementing various kinds of projects, which makes it easier to create strategies not only of the organizations that depend on the creation and implementation of projects (and, increasingly, not just IT projects). This approach to managing collections of projects may take various forms and realizations.

In the literature [20] we encounter the following types of modern collective project management, which – as it seems at the moment determine the leading trends in project management development:

- management of programs – i.e. organized collections of interdependent projects supervised by an external institution – the objectives of the projects are imposed by a sponsor (manager), these projects are different, but mutually compatible in terms of their implementation, realized by different, mutually independent teams. All resources are fixed and determined by the sponsor or his/her agendas, risk and quality management is being carried out at the level of particular projects and the overall program [32],
- management of multiprojects – i.e. a group of projects which are linked by the evaluation of project outcomes determined by an appropriate organizational structure (e.g. project management office/ centre). The projects are autonomous, but they have an agreed hierarchy of objectives, as well as their scope. There is a central resource division, while budgetary decisions are in proportion to the potential benefits of particular projects. The implementation risk is at the multiproject level. Reducing the risk level is possible by moving tasks between projects, resulting from the close cooperation between project partners. The quality of the project is managed both at the central and individual projects' level,
- management of the project portfolio – consists in – similarly to multiproject management – management of a collection of projects, competitive ones, selected in such a way so that it optimizes the benefits of managing an entire collection. Projects are accepted for a particular portfolio according to a specific ranking based upon economic criteria consistent with the priorities of the whole project. The scope of the projects is not mutually agreed. Decisions concerning the budget are made in relation to the whole portfolio, and the projects compete for resources. The risk is being assessed at the project level, and preference is given to projects with the highest probability of successful implementation. Projects are conducted in parallel, and their quality is assessed independently of the portfolio,
- roll-out projects (compared to the model project) – the set of projects with the scope and objectives similar to the model [10], projects are partly similar, they differ with regard to specific features of the environment, in which it is being realized (e.g. implementation of repeatable information systems). Each sponsor establishes their own budget separately. Projects may be realized sequentially or in parallel (in this case they compete for resources). They are evaluated both by sponsors as well as by contractors; however, they are controlled by contractors.

Outlined and indicated directions of project management result from the dynamic changes which occur in the development environment in recent years. They lead mainly to paying more attention to change management resulting in greater dynamism, flexibility and adaptability of projects and the transformation of the relationship to the main stakeholders of the projects. Owing to the development of technology they enable the integration of various types of innovative projects, which can be managed in the network of projects. However, they do not solve all the dilemmas connected with the development of project management outlined in this chapterjustified.

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TRENDY W ROZWOJU ZARZĄDZANIA PROJEKTAMI IT

Streszczenie: Celem niniejszej pracy jest analiza tendencji rozwojowych zarządzania projektami ze szczególnym uwzględnieniem zarządzania projektami IT. Pierwsza część pracy poświęcona jest analizom pojęć, związanych z zarządzaniem projektami i ich stosunku do zarządzania procesami. Następnie autor definiuje podstawowe determinanty zarządzania projektami IT. W dalszej części pracy poruszane jest zagadnienie ewolucji IT i cyklu życia projektu w metodologii zarządzania projektami. W końcowej części pracy autor charakteryzuje nowoczesne metody zarządzania projektami i analizy tendencji w ich rozwoju.

IT項目管理的發展趨勢。

摘要：本研究的主要目的是分析項目管理的發展趨勢，專注於IT項目的管理。初始部分的工作是專門的概念來分析有關項目管理和關係管理的過程。接下來，筆者定義了IT項目管理的基本決定因素。隨後這項工作的一部分，涉及的IT項目生命週期的項目管理方法的演變。在本研究的最後部分，作者描繪了現代項目管理方法和在其發展的趨勢進行了分析。