

COMMUNICATION MANAGEMENT IN PROJECTS

**PIOTR ZASKÓRSKI
WOJCIECH ZASKÓRSKI
KONRAD LIPNER**

**WOJSKOWA AKADEMIA TECHNICZNA
WYDZIAŁ CYBERNETYKI**

Summary: The article tackles the problem of systematization and integration of the communication process in designing and in project management. The basis for analysis of the scope and form of communication were the selected methodologies and tools for project management. Results of selected designing techniques and tools are a premise to present the concept of integration of information on substantive solutions and managerial information based on the possibility to maintain a uniform project repository and to extract from this base necessary information on the progress of works with the assumption of operating a uniform language designing language (project description).

Keywords: communication, project, system, model, methods, management, tools

Introduction

Designing belongs to the area of the basic activity of each subject of operation. The subject of designing may be various types of processes, products and all complex systems of action. The method of implementation of particular project tasks is certainly determined by the scope of the project and its complexity (Zaskórski P. et al., 2013, pp. 176-318). However, in any project action there is a need for appropriate communication between members of the designing entity, both in the substantive and the formal aspect.

The formal aspect means, above all, operating managerial information, that is information about consumption of resources intended for execution of a particular project. This applies both to determining the project needs at the stage of planning as well as successive monitoring and recording of their consumption level along with the progress of works. These resources should be perceived in both financial and material aspects in the dynamics of actions determined according to the fixed logical and temporal sequence.

The substantive aspect means, above all, communication between the project contractors in the field of solutions related directly to the subject of designing. And so, when designing various types of goods this can apply to their parameters technical and technological parameters or the processes of their manufacturing. This is a different type of information, although directly related to managerial information. The method of implementation of particular technological processes or the structure of the product will affect, after all, the level of consumption of project resources.

Management (Griffin, 2004, pp. 8-11) of communication process in project tasks requires, therefore, selection of relevant methods and techniques as well as tools for communication in a project team. This is accomplished by both universal Project Management methodologies, as well as methods, models and tools supporting designing in the substantive aspect. Well selected tools of computer support for designing may be a good basis for improvement, also in Project Management processes. This means, however, the need for knowledge of these tools by the managers and thorough examination of the content of proposed solutions.

The basis for communication is the communication language. Therefore, the so-called languages of problem description (substantive description of project solutions) can be often very useful for communication between the members of a team and the manager. The base of substantive description of the project may be, then, to a large extent a managerial information base. Here, it is possible to notice elements useful for controlling the plan implementation (in on-line mode) and the value of completed works at every stage, with specification of consumption of time, as well as material and financial resources with accuracy down to each contractor. It is worth noting here that this information may be also useful in the future to plan similar tasks.

1. Communication models and standards in a project

Communication models in projects have been shaped for decades. A project understood as a unique task, specified in time and space, requires determination of principles and rules of communication. The communication model is a certain abstract image of the project system in which internal and external information linkages are exposed. The communication model will be thus understood as an abstract image describing the aspect of project reality related to exchange of substantive and managerial information.

The problems of communication take account of various methodologies of designing, starting from those oriented strongly on the process of manufacturing a given subject of designing, up to those having a universal dimension and proven many times in project tasks. The latter include Prince2 (It has become a standard and gained popularity in government administration in the UK), as well as PMBoK methodology. Both methodologies are frequently used in IT projects, but their nature causes that they can be, and are, successfully used in any projects. Communication in manufacturing processes is well reflected by SCRUM methodology (Kniberg, 2007, pp. 7-11).

Prince2 is a generic methodology, which can be used in Project Management regardless of the field, size, type, organization, or cultural conditions. The main characteristics of the methodology include a process approach to project management, as well as focus on products. It is based on seven principles, determining the framework of good practices, which should be observed by persons involved

in a project. These principles result from good and bad experiences in projects. They emphasize:

- Continuous maintenance of business case
- Learning and gathering experience
- Definability of roles and obligations
- Management with a precise specification of stages
- Management with the use of tolerance
- Focus on products (results)
- Adapting the methodology to conditions of a particular project

In the communication model according to this methodology, it is important to define roles and obligations as well as to manage with a precise specification of stages. Compliance with the first principle ensures that a project consistent with Prince2 has defined and approved roles and scope of responsibility in its organizational structure, taking into consideration the interests of Business, the User and the Supplier (Fig. 1).

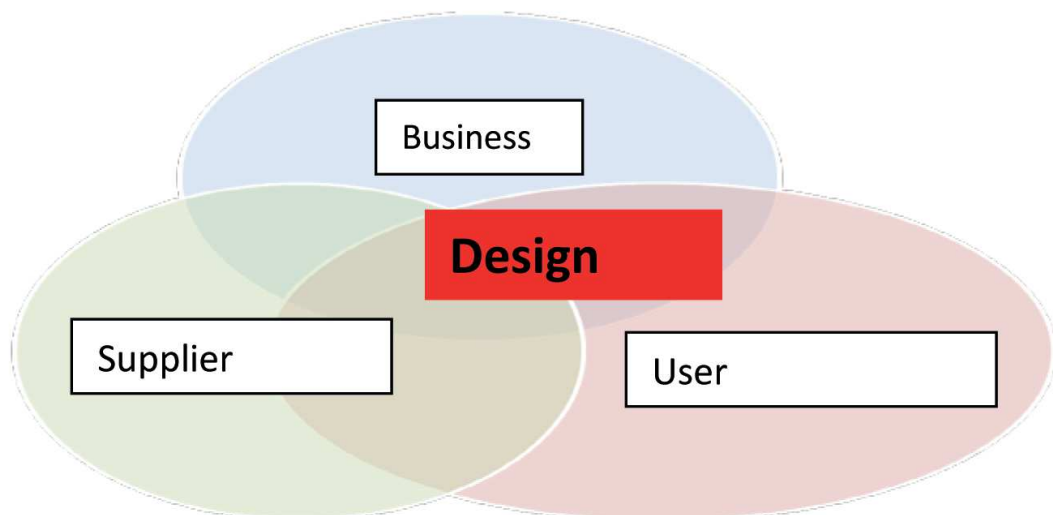


Fig. 1. Main roles defined in Prince2. Prepared by the authors on the basis of OGC 2009, *Managing Successful Projects with PRINCE2* (2009 ed.), Norwich 2009, p. 53

The principle of definability is striving to clearly indicate to the contractors what is expected from them and when, as well as what they may expect from others (including the environment). This principle highlights the basic roles present in all projects, that is:

- Business, that is the sponsor of the project, watching over the result of the project which should be adequate to the cash contribution.
- The User, that is the people who will use/operate the products of the project in order to achieve certain measurable and non-measurable effects.
- The Supplier who delivers resources or knowledge required for project implementation (Norwich 2009, pp. 54-55).

The principle of management with a precise specification of stages ensures that a project consistent with Prince2 is planned, monitored and controlled at

every stage. The management personnel obtains the so-called check points that arise at certain intervals, according to the project implementation schedule. To conclude each stage, the results of the project should be subject to evaluation and validation, and business case, as well as project implementation plans may be verified. The purpose of those actions is gaining confirmation that the project is up-to-date and correctly defined. Based on this, it should be decided whether a project can and should be continued (OGC 2009, Norwich, p. 55). These are thus the places where the communication of crucial importance for project implementation takes place.

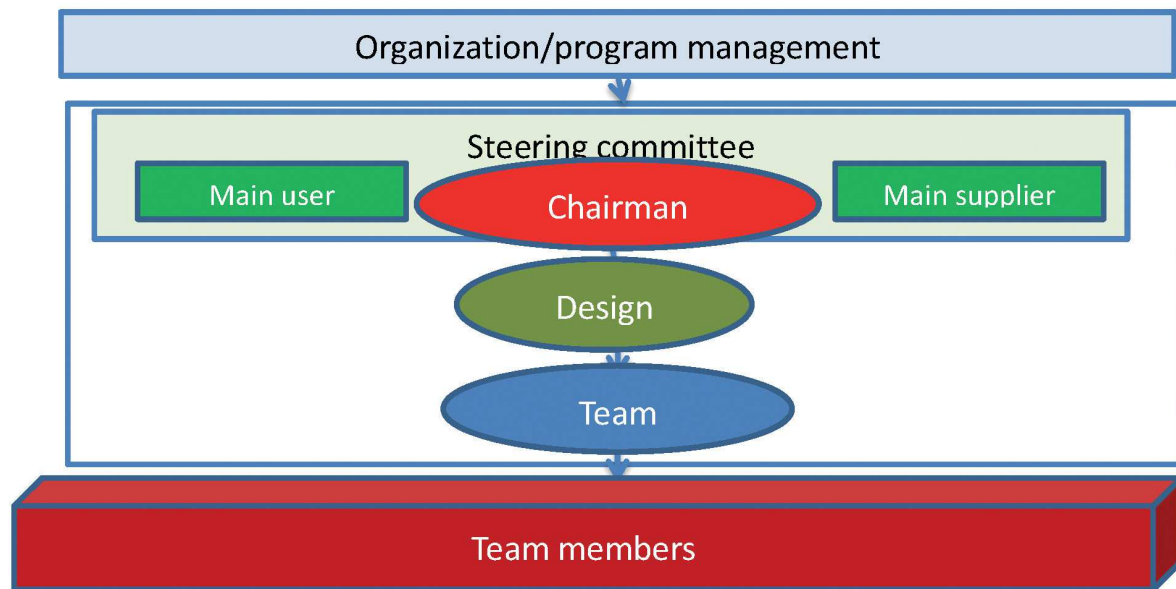


Fig. 2. Main roles distinguished in Prince2. Prepared by the authors on the basis of OGC 2009, *Managing Successful Projects with PRINCE2* (2009 ed.), Norwich 2009, p. 111

An important element of Prince2 methodology are the so-called topics that emphasize the aspects of project management, requiring permanent attention, and focus on:

- Business Case
- Organization
- Quality
- Action plans
- Risk
- Changes in the project
- Progress in project implementation

In the communication model particularly important factors are: organization and action plans. The topic concerning action plans is associated with the principle of “defined roles and responsibilities”. This means the need to prepare and determine organizational structure of project implementation, as well as to define responsibilities and obligations of particular members of the development and management team. Figure 2 shows main roles determined in the Prince2 methodology. Each of

them contains the scope of duties and responsibilities which may be separated and delegated (OGC 2009, Norwitch 2009, p. 100).

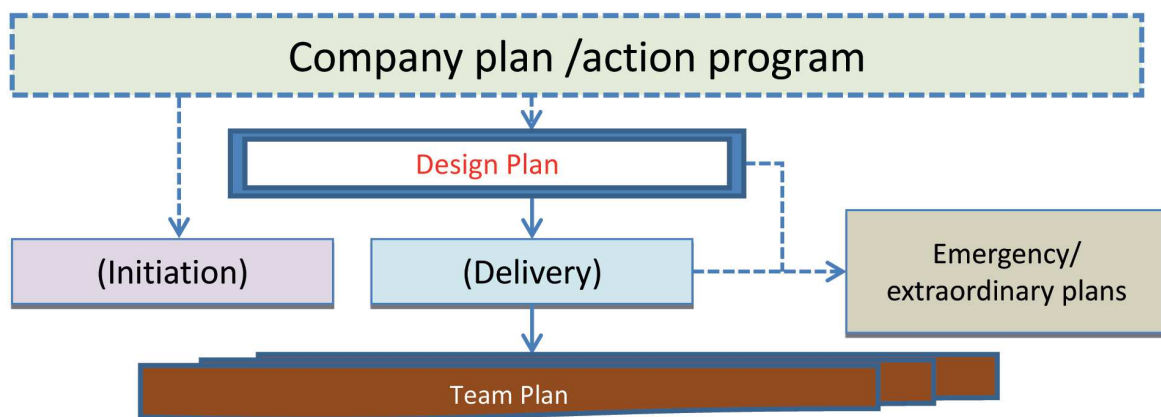
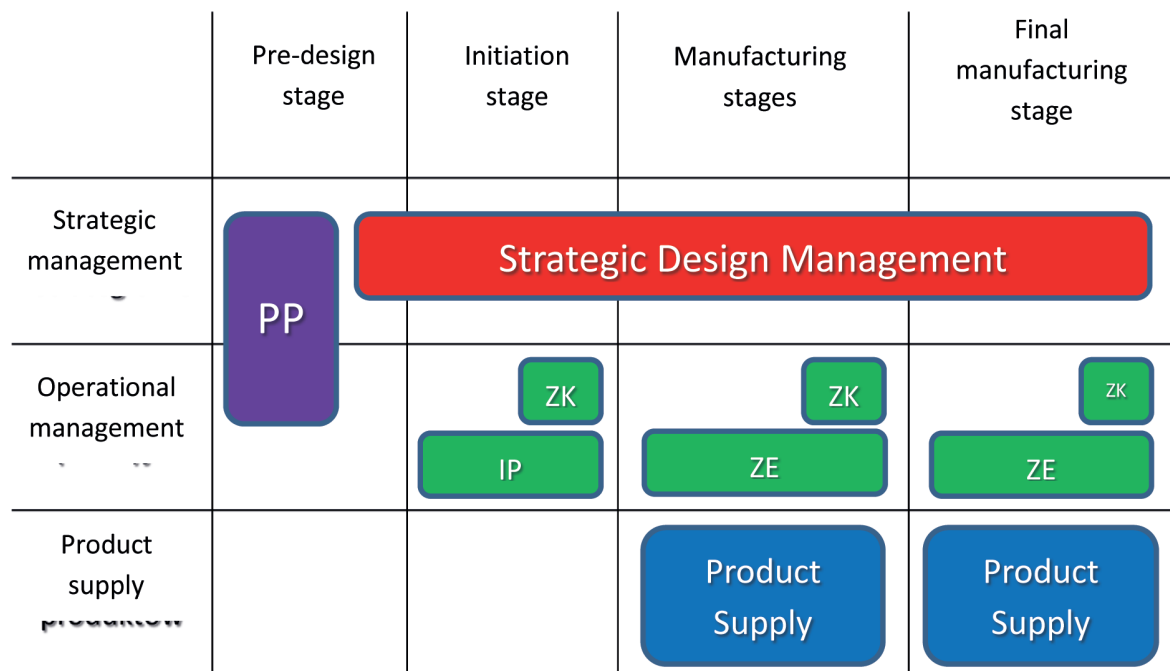


Fig. 3. Planning levels in Prince2. Prepared by the authors on the basis of OGC, *Managing Successful Projects with PRINCE2* (2009 ed.), Norwitch 2009, p. 191

The primary goal of the Action plans topic is to facilitate communication and coordination of the projects by identification of methods of delivery of project products/results to people authorized according to the agreed rules and principles. The lack of action plan prevents correct monitoring of the project, including results of action of particular task groups. Effective project management (Lock D., 2003, p. 106; Phillips J., 2011, p. 34) is based on effective planning. Thanks to the plan, the project participants have information on the requirements, the manner of their achievement (what resources may be used and by whom), as well as the time of occurrence of events essential for the projects and the possibility of achieving assumptions related to time, cost, quality, scope, risk and profits. Prince2 introduces three planning levels (Fig. 3), which reflect the needs of various management levels involved in the project (OGC 2009, Norwitch 2009, p. 188).

An important element for the communication model proposed in this methodology are the processes. In Prince2 methodology, seven processes are identified, containing a number of activities required for strategic and operational management, as well as delivery of products/results of a successfully completed project. Figure 4 shows the presence of processes at particular stages of the project and their affiliation to the management level. For the communication model it is important, in the Prince2 methodology, to distinguish the pre-project stage in which the idea to establish the project is created and the decision about its establishment is made; initiation, in which a detailed project implementation plan is prepared. An important factor here is also business case, project organization and the manufacturing stage (which may occur many times) in which the product delivery is executed. The last manufacturing stage involves closing the project.



PP – Design Preparation; ZKE – Stage Completion Management; IP – Design Initiation; OF – Stage Management; ZP – Design Completion

Fig. 4. Processes of Prince2. Prepared by the authors on the basis of OGC, Managing Successful Projects with PRINCE2 (2009 ed.), Norwich 2009, p. 322

Under stages, processes are separated, which, among others, systematize the scope of communication, that is:

- Project Preparation
- Strategic Project Management
- Project Initiation
- Stage Management
- Product Supply Management
- Stage Completion Management
- Stage Completion (Closing) Management

The scope of communication in the process of project preparation applies to key roles and responsibilities, resources as well as business needs and the very scope of the project in order to prepare the subsequent stage of implementation (Figure 5).

Prince2 methodology emphasizes the role of gathered information and decisions made as to transition to the Project Initiation Stage or abandonment of the project. Strategic Project Management allows the Steering Committee to implement their tasks related to responsibility for project success. While the Project Manager manages the project at the operational level under the rights delegated thereto, the Steering Committee makes key decisions and exercises general control (OGC, Norwich, 2009, p. 352). As it can be seen in Figure 4, Strategic Project Management is present in all stages of the projects and includes a number of actions enabling project initiation (pre-project stage), project implementation (project initiation stage) and implementation of the Stage Plan or the Emergency/Extraordinary Plan

(manufacturing stages), as well as making an immediate decision and decision on closing the project (the final manufacturing stage).

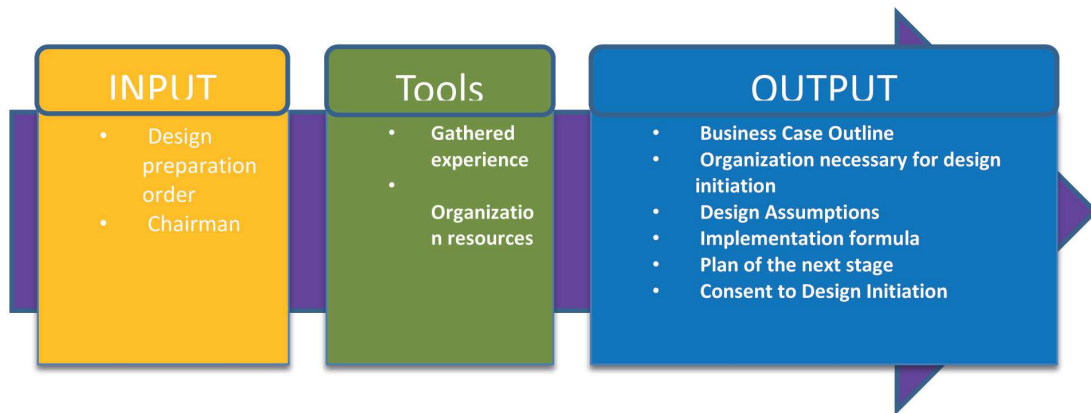


Fig. 5. Project Preparation Process. Prepared by the authors

Project Initiation is the actual launching of substantive activity and may involve selection of tools supporting the communication process in a project team by means of the so-called common project repository, available for particular contractors pursuant to the agreed access rights. The Project Preparation Process allows the whole organization to understand the work to be completed to deliver project products/results, before incurring significant expenses. This process includes preparation of: Management Strategies for Risk, Quality, Configuration and Communication.

Communication Management Strategy is a part of the Project Initiation Document and is supposed to define requirements concerning communication, both internal and external. It should contain detailed guidelines on how the project management team is supposed to send and receive information from entities which it influences or which are participants of the project. Figure 6 presents inputs and output of the process of Communication Management Strategy Preparation. Prince2 – when it is necessary to introduce a formal procedure for involving the project stakeholders – indicates the Communication Management Strategy as the place for its description. In the event when the stakeholders are involved, it is necessary to describe their types, main information about them, desired relations, communication strategies, methods of ensuring appropriate communication (OGC, Norwitch, p. 387). As it has already been mentioned, this document should also contain tools and techniques, information on the cases and the methods of recording data for communication and frequency of communicating under the agreed roles and obligations.

Stage Management involves allocation of tasks for execution and their monitoring, handling events, reporting progress to the Steering Committee, introduction of corrections in order to maintain the stage within the determined tolerances (OGC, Norwitch, p. 406). This is the main operating process, focused on providing products according to the agreed quality parameters, costs, labour and time outlays, risk controlling, as well as events in the context of the business case.

Product Supply Management involves Communication between the Project Manager and the Team Manager, by establishing formal requirements to accept, perform and supply project works (OGC, Norwitch, p. 430). This process is thus a confirmation of formalization of the scope and the manner of communication, and all participants of the process are to be aware of the expected result and outlays, as well as of the fact that information about progress is reported according to the assumptions to the Project Manager.

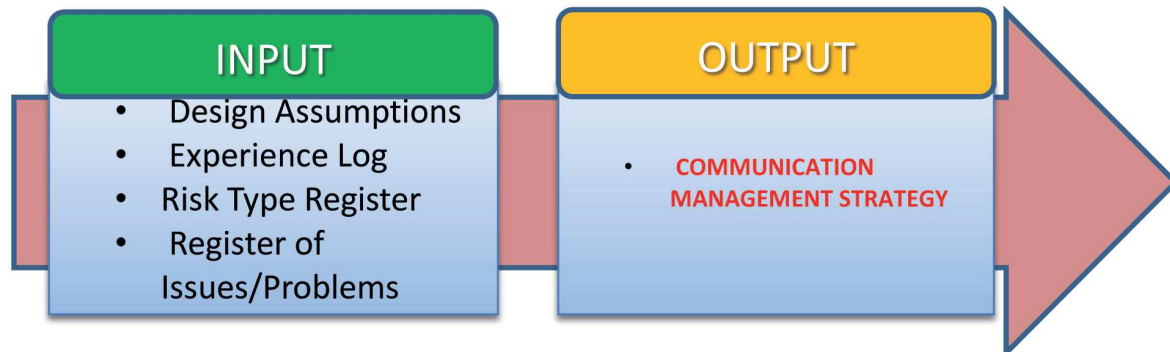


Fig. 6. Preparation of Communication Management Strategy. Prepared by the authors on the basis of OGC 2009, *Managing Successful Projects with Prince2* (2009 ed.), Norwitch 2009, p. 388

Stage Completion Management is a phase of generating information sufficient for reviewing accomplishments of assumed goals of a current stage, accepting the plan for the next stage in the context of the Project Plan, including the risk level and confirming the business validity (OGC, Norwitch, p. 440). This information is provided by the Project Manager to the Steering Committee.

Stage Completion Management is an indication for events (the project status), which can initiate the project product approval process and examination whether the agreed objectives in the Project Initiating Documentation have been achieved or confirmation that different results cannot be achieved. It enables identification of unachieved goals and indication of the possibility of their implementation in the future. Clear completion of the project according to Prince2 gives better results than slow transition to products' use. It is a moment when the responsibility of the project management team for the products ends, with its simultaneous takeover by the customer (OGC, Norwitch, p. 458).

The above presented pattern of communication can be considered a unique organizational standard, where most interactions described in Prince2 methodology are an example of a formalized form of communication. Already at the initial stage of project initiation, when creating the Communication Management Strategy being part of the Project Initiating Document, stakeholders are identified, and conditions are detailed, related to internal and external communication. Additionally, communication related to project management itself is strictly determined. Each process clearly determines situations and organizational relations where an information relation must occur, and the feedback which should be provided. However, it should

be noted that Prince2 methodology does not specify communication problems at the manufacturing level, specifying communication only to the Project Manager – Team Manager level. It may be, however, enriched with other tools, which can support communication processes at this level.

Another, also well-known pattern may be PMBoK methodology, which can be considered a standard used in many projects for various trades (PMI, 2008, p. 13). It contains a set of good practices with observance of value and usability criterion. Good practices mean skills, tools or techniques which, when used, increase chances of success in the case of a wide range of projects. The responsibility of the organization or the project management team is selection and application of their relevant set.

The basic components highlighted in PMBoK are Process Groups and Knowledge Areas. There are 42 management processes organized into 5 Process Groups, and 9 in the so-called Knowledge Areas. The Process Groups have direct interrelations and usually are undertaken in the same sequence (Fig. 7).

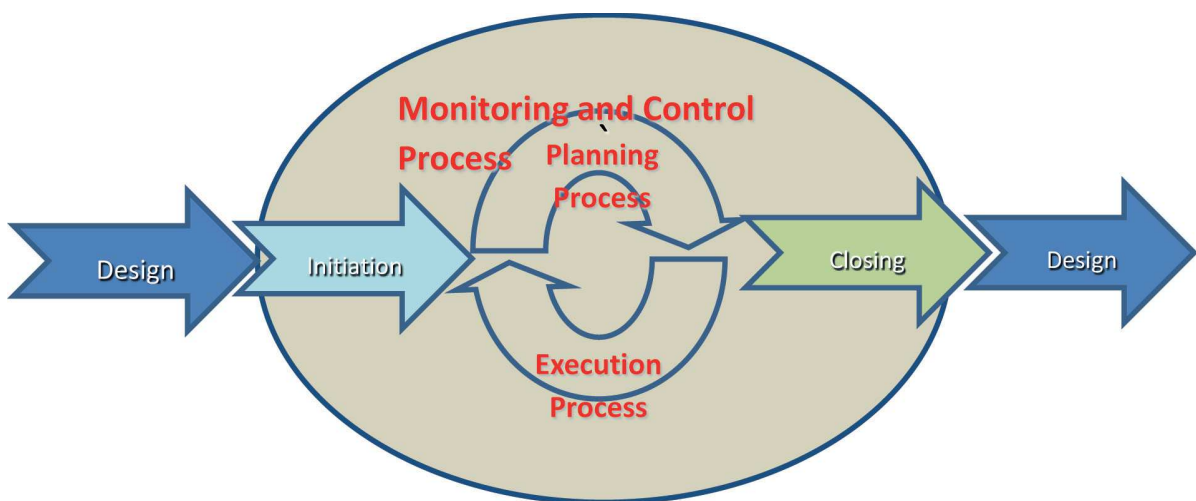


Fig. 7. Groups of managerial processes. Prepared by the author on the basis of PMI, *A guide to the Project Management body of knowledge - Fourth Edition*, Newton Square 2008, p. 40

Without going into too much detail – it can be stated that the Process Group for:

- Initiation includes defining a new project or a new phase of the existing project, including scope of the project, initial budget, and stakeholders ((PMI, 2008, p. 44).
- Planning applies to determination of the scope of actions, identification of goals and development of the required action plan (Fig. 8). Disclosure of new facts may imply additional planning actions (PMI, 2008, p. 46).
- Performance leads to performance of the work defined in the project plan, intended to fulfil the requirements. Processes from this group support, among others, coordination of people and resources (PMI, 2008, p. 55).
- Monitoring and Control applies to tracking, reviewing and regulating progress and efficiency of the project, identification of areas requiring

introduction of amendments to the plans and initiation of appropriate changes. In the case of multi-phase projects, also corrective or preventive actions are conducted, to ensure compliance of the entire project with the plan (PMI, 2008, p. 59).

- Closing includes, above all, finishing all activities across the whole Group of Project Management Processes, which should lead to formal closing of the project, the phase or any obligations resulting from the contract with provision of verification of the completeness of processes' execution.

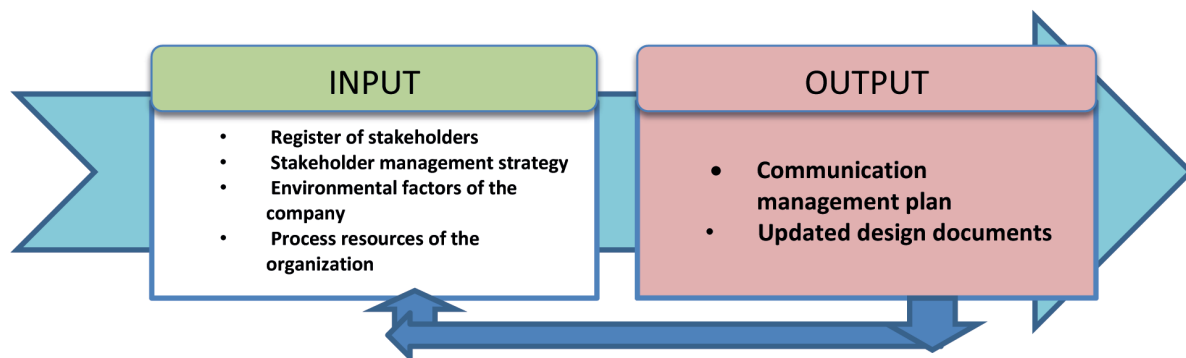


Fig. 8. Communication Plan. Prepared by the authors on the basis of PMI, A guide to the Project Management body of knowledge – Fourth Edition, Newton Square 2008, p. 53

PMBoK distinguishes nine Knowledge Areas, such as:

- Consistency for identifying, defining, combining and unifying various managerial processes and activities in the field of Process Groups and, above all, for making decisions related to reserving the resources, taking into consideration internal dependencies in Knowledge Areas (PMI, 2008, p. 71).
- Scope to ensure that the project contains only actions necessary to achieve success (PMI, 2008, p. 103).
- Time, that is emphasizing processes required to complete the project on time (PMI, 2008, p. 129). Including duration of project activities, availability of resources, ordering tasks or controlling the schedule.
- Costs, that is estimation, budgeting and control of costs so that the project could be completed within the agreed budget (PMI, 2008, p. 168).
- Quality as care for processes and activities of organizations, determining the quality policy, goals and responsibility. Quality management systems are implemented through policy and procedures containing activities aimed at continuous improvement (PMI, 2008, p. 189).
- Human Resources, that is emphasizing processes determining the principles of organization, management and leadership of a project team (PMI, 2008, p. 215). It is worth indicating here tools such as training, activities focused on team integration, determining acceptable behaviours, solving conflicts or using interpersonal skills in order to assess attitudes of

the project members. This has a highly positive impact on interpersonal communication.

- Communication, that is orientation on processes that provide access on time – accordingly created, collected, distributed, archived, extracted and adequately arranged – information in the project.
- Risk covering processes connected with risk management planning, identification, analysis and planning reaction to risk. The purpose of these processes is to increase the probability and the impact of positive events and to reduce the probability and the impact of negative events on the project (PMI, 2008, p. 273).
- Orders containing processes related to acquisition of products, services or results from suppliers from beyond the project team.

All knowledge areas require preparation of relevant information resources. Therefore, Project Managers communicate on the current basis with team members, as well as the project stakeholders, both internal and external. Effective communication is a platform between diversity of stakeholders involved in the project, combines various cultures and organizations, levels of knowledge, as well as perspectives and goals related to the project and its results (PMI, 2008, p. 243). In the field of Communication Management, it is possible to distinguish the Processes of Stakeholders Identification, Communication Planning, Information Distribution, as well as Reporting Efficiency and Management of Stakeholder Expectations. In the Process of Stakeholders Identification (Fig. 9) the aim is to identify all people or organizations included in the project, and information about their purposes, involvement in the success and completion of the project are documented.

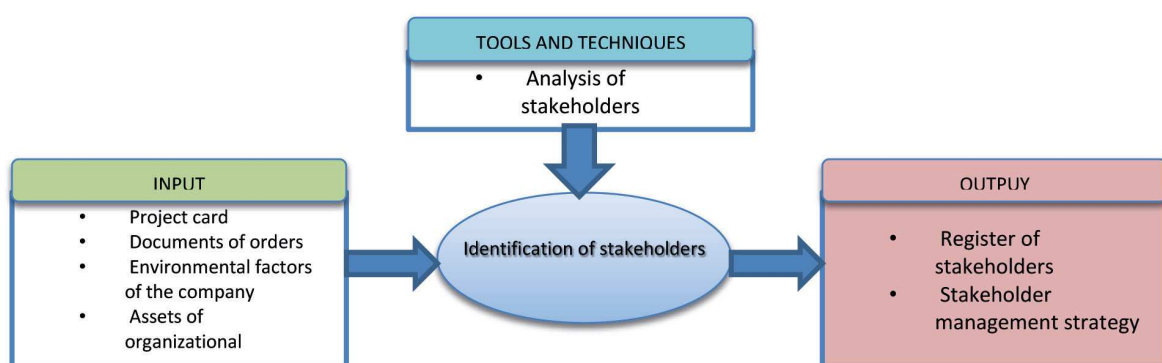


Fig. 9. Stakeholder identification process. Prepared by the authors on the basis of PMI, A guide to the Project Management body of knowledge – Fourth Edition, Newton Square 2008, p. 246

Information Distribution Process (Fig. 10) applies to respective information, which should be delivered to stakeholders according to plan. It is a continuous process, taking place throughout the whole life cycle of the project in all processes, however, with the main emphasis on development processes.

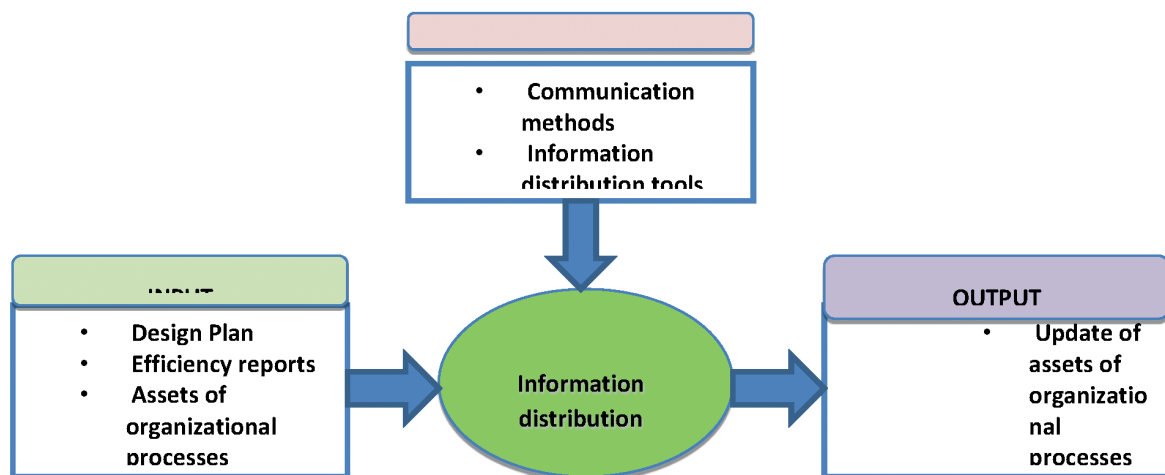


Fig. 10. Information distribution process. Prepared by the author on the basis of A guide to the Project Management body of knowledge – Fourth Edition, Newton Square 2008, p. 258

Communication Planning (Fig. 11) includes, above all, determining informational needs of project participants distributed over time.

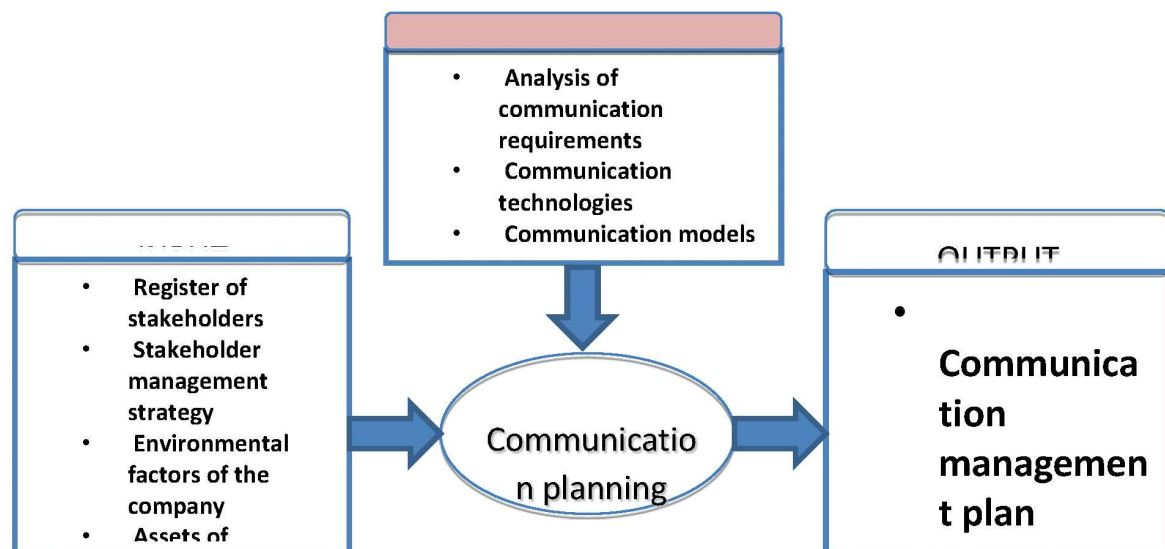


Fig. 11. Communication planning process. Prepared by the authors on the basis of A guide to the Project Management body of knowledge – Fourth Edition, Newton Square 2008, p. 252

Efficiency Reporting (Fig. 12) is a process ensuring obtaining reports about the current state as well as efficiency measurements and forecasts. It requires recording events and their monitoring as compared to the base plans (PMI, 2008, p. 266).

Stakeholder expectation management (Fig. 13) is a process including cooperation with stakeholders to satisfy their expectations, and to solve problems reported by them, which may increase a chance for acceptance of project solutions through negotiations and influencing their needs.

PMBok contains thus quite an extensive description of communication processes covering appropriate identification of stakeholders, their needs and appropriate communication consistent with the communication plan. For each of

these processes, a number of techniques and tools is indicated. In PMBoK, also IT tools supporting communication are indicated (such as e-mail, bulletins, forums. Specification also covers techniques of analysis of communication requirements, basic communication models as well as interpersonal skills (one of the supplements lists and describes interpersonal skills)).

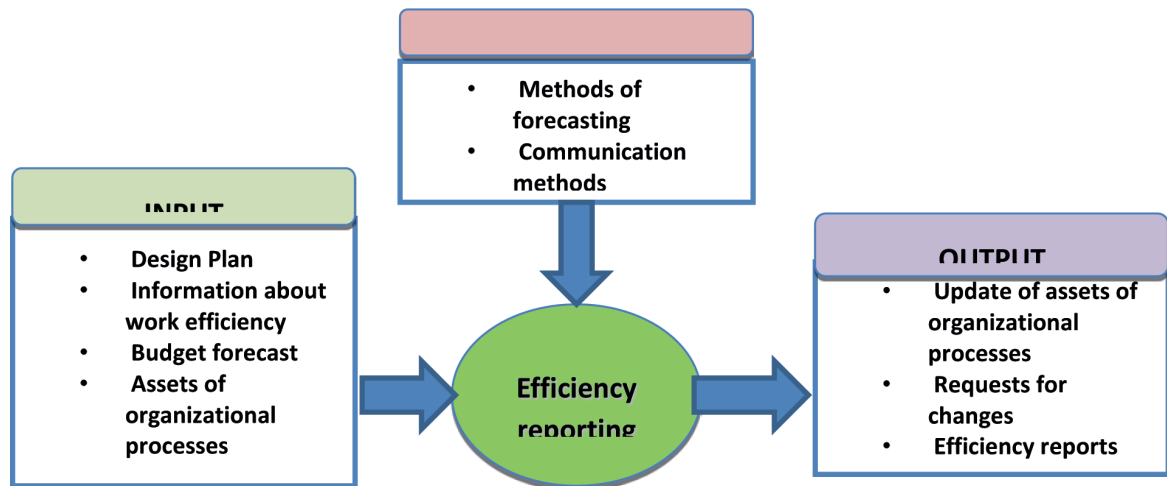


Fig. 12. Efficiency reporting process. Prepared by the author on the basis of A guide to the Project Management body of knowledge – Fourth Edition, Newton Square 2008, p. 266

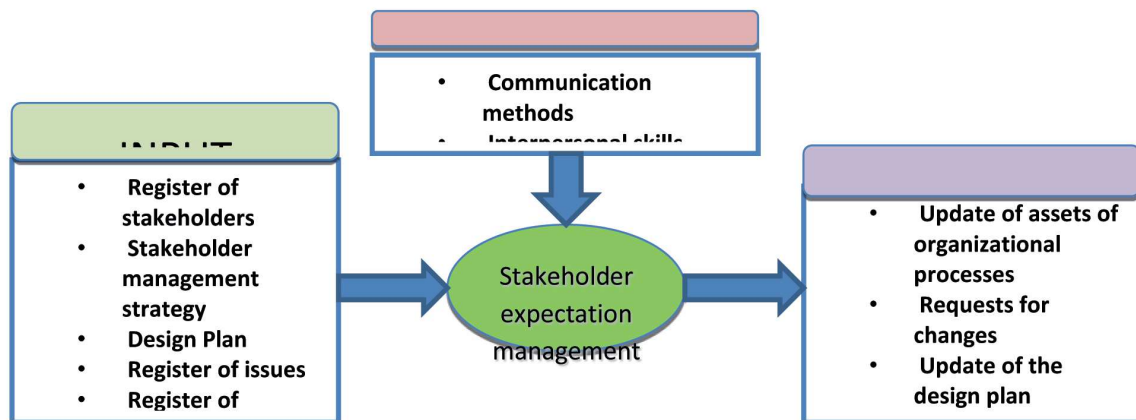


Fig. 13. Stakeholder expectation management process. Prepared by the authors on the basis of A guide to the Project Management body of knowledge – Fourth Edition, Newton Square 2008, p. 262

As it has been already mentioned – there are many various methodologies of managing and conducting projects which may be a certain communication pattern. However, not all of them can be adapted to trade projects. Apart from universal methodologies, also manufacturing methodologies are used, e.g. like Scrum, with a focus on flexible product manufacturing, that is creating the so-called „framework” of a solution as part of which it is possible to solve complex adaptation problems, productively and creatively delivering products of highest value possible.

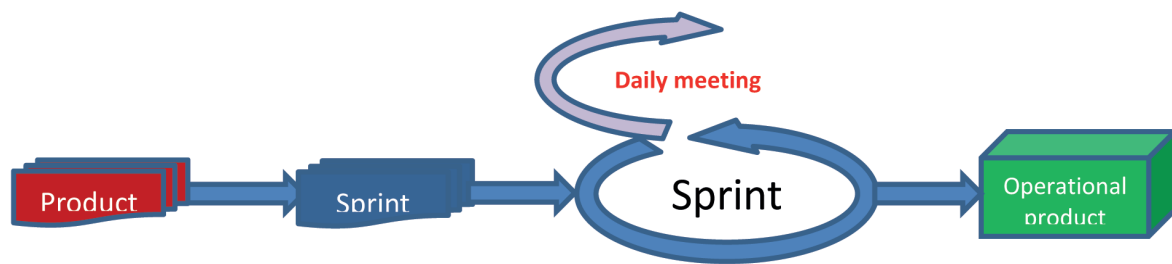


Fig. 14. Scrum methodology model. Prepared by the authors on the basis of www.scrumprimer.org/anime, 1.09.2013

Scrum is unfortunately quite difficult to master, because it constitutes certain frameworks used in managing processes of manufacturing complex products. It enables recognition of ineffectiveness of product manufacturing management, as well as practices used for its production so that they could be improved (Schwaber et al., 2013, p. 3). A dynamic component of action under Scrum methodology is the so-called “Sprint”, that is single iteration, in which tasks in the Sprint Register are transformed into an operational product. However, this requires current communication in the mode of Daily Meetings (Fig. 14). The Sprint Register contains a subset of tasks from the Product Register. This means that the output product may be obtained by an iterative method. Scrum recommends thus appropriate competencies of team members, including creativity, flexibility and productivity, which make team independent from the need to use external assistance.

Without exposing details of this methodology – it can be indicated that in the overall model, there are three roles: Product Owner, Development Team) and Scrum Master. Beyond the team there are: Business Owner and Stake Holders (Schwaber et al., 2013, p. 4). To ensure success actions the decisions of the Product Owner must be respected by the whole organization. Additionally, nobody beside them may impose the set of requirements to the Project Team and the Project Team cannot operate to the order of a person other than the Product Owner (Schwaber et al., 2013, p. 5). The Scrum Master supports the Product Owner and the Development Team (Schwaber et al., 2013, pp. 6-7). Scrum defines a set of events (Fig. 15) defining regularity and minimizing the need of earlier undefined meetings. A characteristic feature of such events is that they have their maximum duration.

It is worth only drawing attention to the fact that Sprint is a central part of this methodology. It takes a maximum of one month, during which another version of a complete product, operational and ready for delivery, is manufactured. The main element in communication is Sprint Planning, that is planning any work, which will be performed during Sprint. Planning takes place through cooperation of the whole team. The person responsible for organization and conducting the meeting is the Scrum Master. The meeting has a fixed agenda (Schwaber et al., 2013, pp. 8-9). Daily Scrum Meeting (Time limit introduced for such a meeting is 15 minutes) is used for synchronization of tasks and creating the plan for the nearest 24 hours. It takes place among the Development Team and consists in the work inspection

performed since the previous Daily Scrum Meeting, as well as predicting the activities which should be taken before the next stage. During this meeting, every member of the Contractors Team answers the questions:

- What work did he/she perform yesterday, which helped the team achieve the goal of Sprint?
- What work will he/she perform today to help the team achieve the goal of Sprint?
- Does he/she see any obstacles hindering achieving the goals of Sprint?

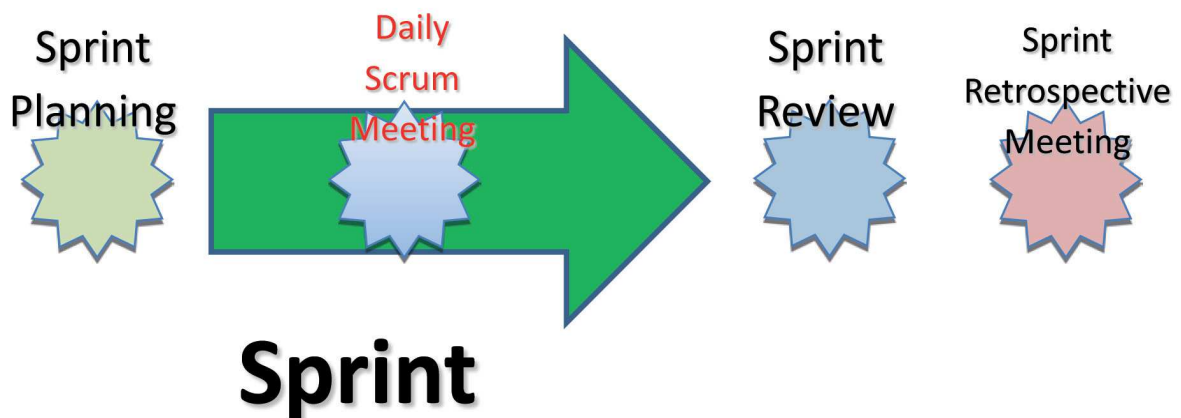


Fig. 15. Events in Scrum. Prepared by the authors

Thanks to Daily Scrum Meeting, communication is improved, it is possible to eliminate obstacles, which also favours rapid decision-making and improves the level of the team's knowledge of the project progress. This meeting is crucial for the process of inspection and adaptation (Schwaber et al., 2013, p. 10). The Sprint Review Meeting is made at the end of each Sprint in order to investigate the issue and, where necessary, the update of the Product Register. During the meeting the Scrum Team, along with stakeholders, review the results of the whole Sprint. It is an informal meeting, not related to review of the project status, and presentation of achievements is intended to obtain feedback and improve cooperation. Sprint Retrospective Meeting (takes 3 hours for monthly) fosters creating the improvement plan that will be implemented in the next Sprint. In addition, strengths and weaknesses of obtained solutions are identified. Artefacts in Scrum represent work or value obtained thanks to its execution. Artefacts defined in Scrum are designed so as to maximize transparency of key information and integrity of their understanding (Schwaber et al., 2013, p. 12).

One of the pillars on which Scrum is based is Transparency. It means that all important process aspects must be visible and equally understood by all persons responsible for achieving the results (see: Sutherland J., *Agile development: Lessons learned from the first Scrum*, 10.2004 and www.scrumprimer.org, 1.09.2013). To achieve it, it is necessary to provide effective communication between the Scrum participants. Decisions concerning optimization of the value and risk control are

based on perception of the condition of artefacts. If transparency is complete, decisions have rational foundations, and if not, the decisions may be defective and the risk may grow. Scrum puts thus a very strong emphasis on communication: The Contractors Team fully participates in activities, starting from Sprint Planning Meeting until its summary, communicating with other participants of the Scrum Team. The central place of the process is Daily Scrum Meeting, which is the core of project communication. The methodology forces day-to-day communication with all Team members. Additionally, when using this frequent communication and excluding from daily meetings people from the outside of the Contractors Team, psychological conditions encouraging the team integration process are created. This has a positive impact on the quality and openness of communication. Each pattern/template/standard of actions is more effective if it is “surrounded” (supported) by appropriate tools to a stronger extent.

2. Communication tools

Communication tools are used to support the communication process in a project team (project organization). It is quite a capacious category, covering both advanced applications enabling communication in the managerial layer of the project (MS Project, MS Project Server) and tools to manage tasks (Redmine, Jira), versioning and inspection of technical-technological solutions (Git, Gerrit), or even interpersonal training. As mentioned before in the introduction, also the tools supporting the process of substantive solutions foster the exchange of managerial information (Wilczewski, 2010, pp. 10-15).

Project management tools are an entire family of tools used mainly between the operational and the strategic level. Main characteristics distinctive of these tools are the possibility of reporting on measures consumption level, availability of resources (including human resources) and information related to the project implementation schedule (an example of the tool from this group is MS Project Server. It is a tool enabling integration of many designs managed by means of MS Project application, enabling access to them by means of a network interface). MS Project is a representative tool of this class. Thanks to intuitive interface, it is possible to enter the tasks along with the estimated time of their duration, define their interrelations, specify the pool of resources and the demand for them in particular tasks. More advanced options enable setting the availability calendar for particular resources, or levelling resource utilization. Throughout the project, the progress of works on particular tasks is updated. On the basis of the entered data, it is possible to generate various reports on using resources, both current and planned, deviations from the base plan, including costs etc.

The MS Project package has communication possibilities related to defining additional elements such as collections of documents, lists of risk and events, calendars, etc. It is also possible to define, on particular elements, flows that are related

to various events and so, for instance, can communicate to the user upcoming important deadlines, create a mechanism of common of inspection of documents etc. An important element related to communication is also the possibility of successive generation of simple collective reports informing about the condition of various indicators of the project, e.g. in the form of green, yellow and red buttons. It is an extremely simple message related to the condition of project portfolio enabling signalling potential problems.

The group of task management tools contains tools whose main aim is broadly understood management of activities with the agreed goals. Such systems are used both for project works, as well as operational tasks, e.g.: problems related to reported errors (bug tracker). These are thus systems supporting actions in the operational management layer. One of the examples of the tool from this group is Redmine (Distribution on Open Source terms, and thereby broad availability caused fast development of the application. Currently the library of plug-ins contains more than 400 items extending the tool's capabilities to a various extent). It is a flexible online application supporting tasks management, which aggregates many areas related to projects, in particular, it contains a system for tracking defects with their defined life cycle. The main screen of the project is built in such a way so that it would be possible to easily acquire plenty of general information about the project, such as: project description, time frames, stages, milestones, roles and users. Composition of the main screen can vary among projects, which enables adapting the presented information to the type of the project and the needs of its participants. Apart from the basic functions, that is management of tasks and project team, there are available modules such as Forum, Wiki, Document Repository, as well as Budget Management and Risk Management

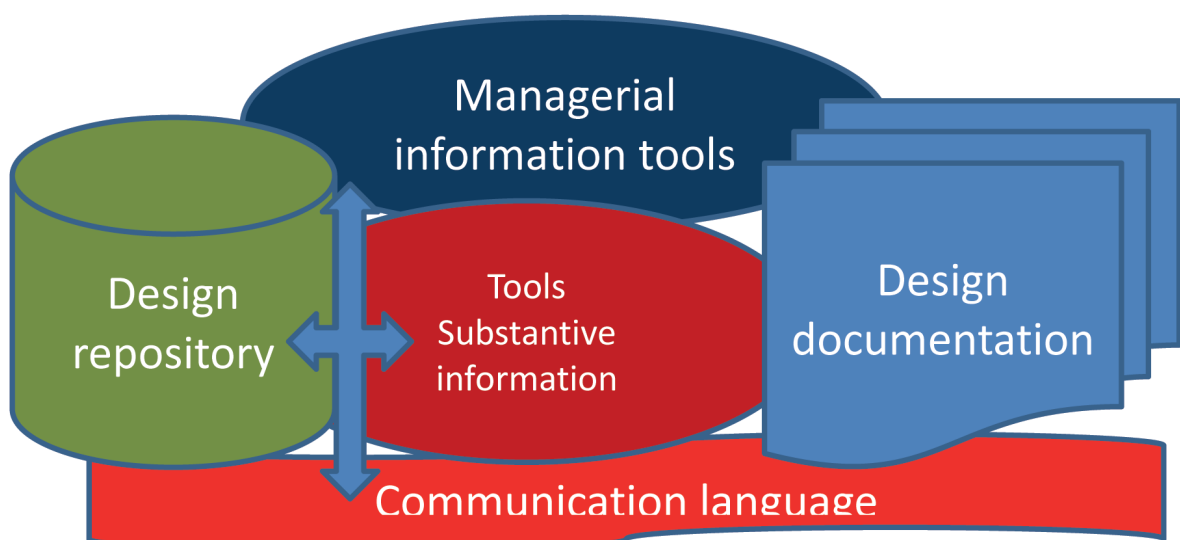


Fig. 16. Tools integrating project management. Prepared by the authors

Contemporary projects may be supported by knowledge bases. **Knowledge bases** are repositories enabling collection, organization, division, searching and use

of information. These are extremely important tools (Sample tools from this group are MediaWiki, Atlassian Confluence or MS Sharepoint. Lightfoot J., Beckett Ch., Microsoft Sharepoint 2010 PL, Helion, 2011) in the context of designing, since they allow the team to jointly gather knowledge related both to the field of designing, as well as organization, under which projects are implemented. Examples of types of information that are stored – include, above all:

- Frequently Asked Questions (FAQ);
- Information on how to perform various tasks, e.g.: configure environment, use tools, etc. (How-to);
- Processes and procedures that most often relate to the team.

The next group is **a set of interpersonal tools** (Thomson, 1998, pp. 17-22), which are related to development of the so-called “soft” competences, that is social competences. The project is implemented by people who occupy different positions and each of them has different skills resulting from various environments, or cultures. Tools leading to development of interpersonal skills are the base necessary for project team building. An example may be interpersonal training. It is a method to gain knowledge on one’s own reactions in relations with other people. This knowledge is built through experience.

An important issue for integrated communication in the project are **the tools substantively supporting project-manufacturing processes** (Fig. 16). This group of tools includes tools such as CAISE/CAD (Computer-Aided Information Systems Engineering/Computer Aided Project). These are systems facilitating and accelerating developing organizational and technical solutions through processes of modelling/variants, generators of documentation/process lines and creation of knowledge bases. An example of the basic tools from this group may be Enterprise Architect or Visual Paradigm which may be useful for modelling by means of language, among others, UML (Unified Modeling Language) for many aspects of created technical-technological solutions. On the basis of constructed models it is possible to generate documentation of project solutions. The strength of these tools is operating a uniform language of the project/problem description, analyser of formal and logical correctness of these descriptions and maintaining consistent repository of description of project solutions and possibility of generation of technological solutions, as well as documentation. Data collected in the project repository may be a good source base to support Project Management. They can provide information on task completion deadlines (build-up of solution descriptions) by particular members of the project team.

3. Integrated communication model

The project is, by definition, a unique being and in every project, a comprehensive communication model will be determined by the scope and the method of its performance. In order to prepare the communication model in the project,

account should be taken of the complexity of the project, the size of the team taking part in designing, available designing tools, processes and restrictions imposed by the organization etc. At a high level of generality it can be stated that the model should include elements of communication concerning the following areas, occurring during typical system designing as the object of designing:

- Customer requirements /expected functions of solutions and the way they are gathered, description e.g.: in the formal language (e.g.: in UML) in the form of „stories” (User Story)
- Tasks to be performed and the way they are described, including the way they will be allocated and reported
- Project documentation according to the binding documenting standards, principles of communication at the repository level, principles of revision of project solutions, their testing, practices of continuous integration
- Project meetings, including stages of verification of solutions in relations with progress of the works, planning the tasks, estimation of project's success and solving problems

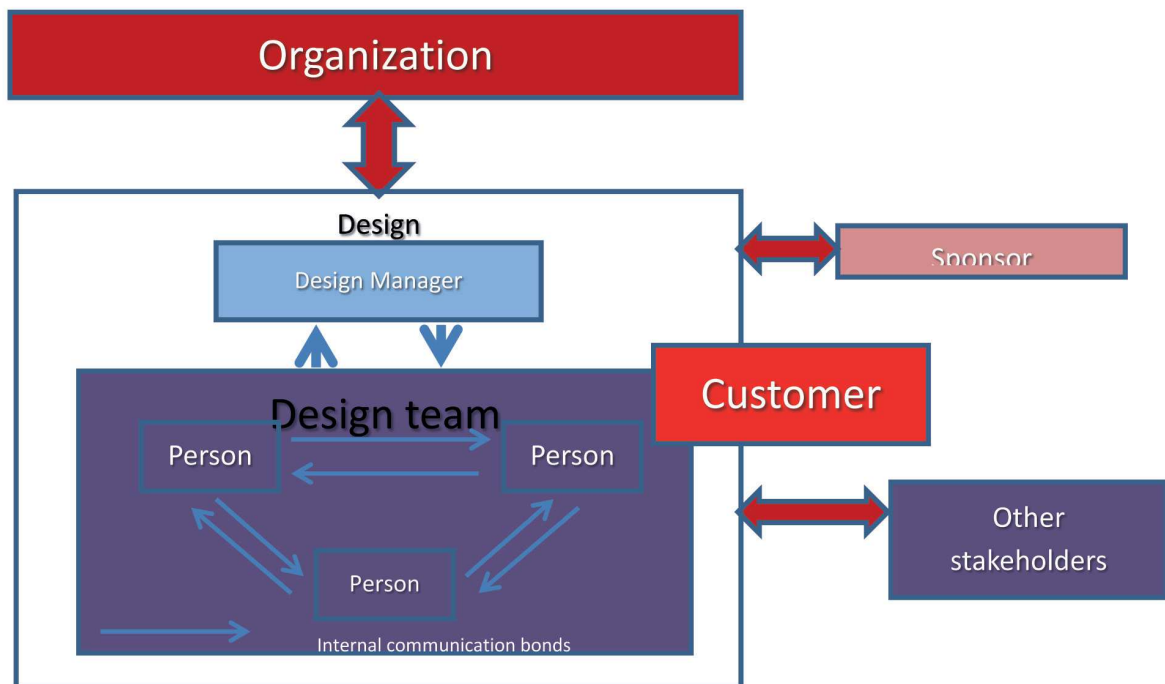


Fig. 17. Participants of communication processes. Own study

The communication model should also take account of whether and how the relations between the above elements are maintained. In addition, principles of communication are important, because in designing informal communication takes place quite often. Communication management in the project requires, therefore, determining the ground rules for all relationships, such as the basic scope of content or the frequency of the presence of a specified need. In complex projects or projects implemented using advanced tools there is a strong need for formalization of communication, owing to the necessity of maintaining consistency.

Communication in designing may be focused on the manufacturing process. It includes then a number of issues related to the project repository (version management etc), documentation, as well as generating and gathering knowledge. An important element of designing, that emphasizes the need for integrated communication are organizational problems such as the principles of using various systems supporting designing, procedures related to obtaining access rights to these systems, events related to the project implementation, information on emerging problems (e.g.: related to hardware or system failures or, for example, the absence of project members).

The model of communication integrated in the project management will depend on the defined roles and responsibilities, requirements imposed by organization, complexity of the project etc. Hence, a comprehensive communication management model in the project should take account of organization of teams, customers, sponsors and stakeholders with observance of interpersonal communication rules. Figure 17 contains a model including the communication process participants in the project. A central element of the model is the Project Manager, who is responsible for implementation of the project, as well as representing outside the project team and the results of its action. It is a role mainly related to external communication, as well as supervising and improving communication within the project. It should be noted here that the Customer himself/herself is in the environment of the project, however, he/she participates actively in the designing process, e.g.: as a consultant, person explaining ambiguities, related to the subject matter of designing.

The communication principles defined in the integrated model will vary depending on the type of entities which communicate and the purpose, or principles imposed by the organization. In the case of formal communication, it is necessary to precisely specify the recipients, the content of messages (both information scope as well as principles concerning the form), the frequency of sending them and the manner of confirming message receipt. Communication management does not require formalization, and so it needs determining the ground rules. Informal communication can often dominate in the project team throughout the entire designing process. The communication process model must thus contain activity of manufacturing communication strategy, which will ensure that principles of communication with all identified stakeholders have been determined.

The main place of communication is the contact point of the project organization itself (the project team) and the organization in which the project is implemented. The reason for communication in this case is the need to monitor progress of works, control the execution of works and the budget (see PMI, *The high cost of low performance: The Essential role of Communications*, Newton Square, May 2013). Similar reasons occur in the case of the sponsor and the customer, with additional reporting of requirements related to the project product or the will to examine whether project goals are achieved. Stakeholders are a group for which

communication is the basis for ensuring compliance resulting from legal and administrative regulations. It may apply e.g.: to government organizations requiring fulfilment of various conditions related to the subject of designing (e.g.: General Personal Data Inspector requiring reporting personal data collections), Open Source community (availability of various types of repositories), or the persons in the organization who may be potentially interested in implementation of the project results in their units.

The scope of communication results from the content of basic tasks related to management of projects, that is from the process of planning, delegation of authority and control. Appropriate management level must have information related to the progress of works, extraordinary situations, availability of resources and degree of use of measures.

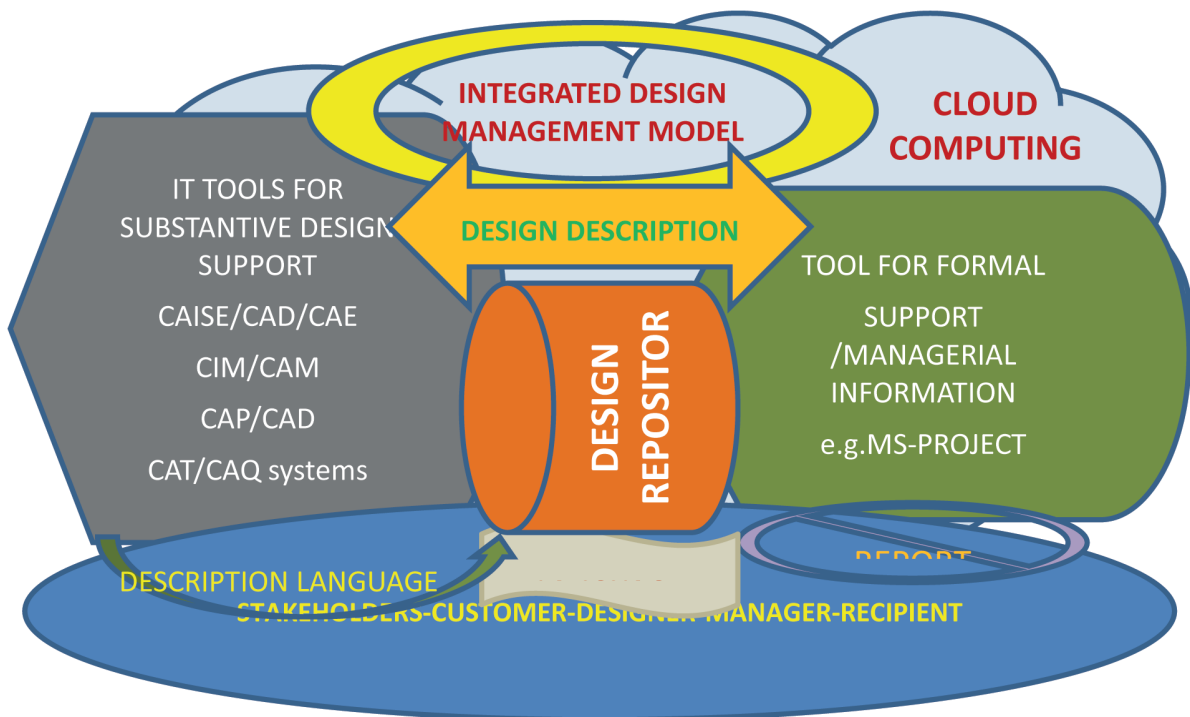


Fig. 18. General model of integrated communication in the project. Own study

The universal communication model should include the selected Project Management methodologies, which, thanks to the process approach, systematize issues related to project management and designing. Each of them deals, in a slightly different manner, with the area of communication, emphasizing, however, that this is a very important part of project management. The process approach imposes, however, some restrictions, which exclude the area of interpersonal communication from the methodologies. The methodology closest to this field is Scrum, representing agile methodologies, which, thanks to some activities, positively affect the area of interpersonal communication. On the one hand, formal methodologies can introduce significant labour expenditure connected with project management for projects of low complexity and short time of duration, but introduce necessary order to the projects with high complexity. On the other hand manufacturing,

agile methodologies – due to the lack of extensive mechanisms related to project management – in the case of complex projects and large teams can be favourable for creation of problems in efficient communication.

Integrated model of communication management in the project (Fig. 18) is based on the assumption of availability of tools (CAISE (Computer Aided Information Systems Engineering) or CAD (Computer Aided Design)) and their knowledge by the project team and combination of substantive information on solutions proposed in the project with the management information through a common project repository. Description of project solutions, expressed in appropriate project language (modelling language) could largely serve as the language of communication with the Project Manager and the Stakeholders. Reports generated by the selected components of IT support tools (report generators) may be helpful not only in the process of control of formal and logical correctness of these solutions (analyser of descriptions in a given language of project description provides a certain level of such correctness), but can simultaneously constitute a good image of illustration of the progress of works, as well as used time and cost resources, as well as material and tangible resources (taking account of the time aspect). They can thus constitute a good source of details of managerial information.

The possibility of interactive cooperation between stakeholders is not only the company strategy, but also the type of security policy in managing information and the ability to respond to changes. For instance, systems of class CAx (Computer Aided x, where x: = D – Design or E – Engineering or P – Planning or etc). see: Chlebus, 2000) are based on this criterion and are, in fact, the whole family of solutions whose main assumption is consistency and information integration as defined by operation of common information (common data, the so-called base systems maintain data identifying resources of various classes like glossaries) generated/collected in various phases of the project and decision-making process. This means that in many cases, information (data group) generated once may be useful in other phases of execution of particular processes without the need for their repeated generation or collection. And so, CIM (Computer Integrated Management) systems supplement well the organization management processes of project and manufacturing nature. In these systems it is possible to notice separation of managerial and technical-project areas. In addition, in spite of participation of various entities, selective access to information is provided.

The tools supporting the process of designing system solutions (complex) are flexible, and their broad spectrum (also available in the so-called computing “cloud” (Zaskórski, 2012, pp. 24-33), that is Cloud Computing) ensures that it is relatively easy to select tools with high degree of adaptation to the communication policy assumed in the project. Managerial information tools should be directly combined with tools supporting the designing process and be based on the common repository of the project. In practice, however, they support mainly basic processes, as well as the aspect of transporting messages (managerial information), forming only

the basic shape of the sent message. Thus, they do not contain direct instructions on effective implementation of the communication process in a given context. It is influenced by people managing (see: Office of Project Management Process Improvement, *Project Communication Handbook*, Sacramento 2007) these tools by their configuration as well as integration with other tools.

Generally, it can be stated that the area of interpersonal communication (see: Jedliński K. et al., 2008, *Interpersonality training*, 2nd ed., Warsaw 2008) should be a key element related to communication in each project, since finally, people communicate in the project. The way various entities communicate to a large extent determines efficiency of project works, the quality of manufactured products, and thereby also customer's satisfaction. Thus it is worth investing in this area already at the stage of creating the project team.

4. Conclusion

The article tackles the problem of systematization and integration of the communication process in designing and in project management. The attempt to present the concept of integration of information on substantive solutions and managerial information, presented herein, is based on of the possibility to maintain a uniform project repository and to extract from this base necessary information on the progress of works with the assumption of operating a uniform language designing language (project description). Such languages include graphic languages (including the so-called UML language, see: Hamilton K., Russ M., *UML 2.0: Wprowadzenie*, Helion, 2007). The authors are aware of the fact that the tools for substantive support of designing may be helpful in generating detailed managerial information, but the tools of computer support of project management maintain their usability, as they operate on generalized information, focused on description, planning and consumption of various classes of resources assigned to the project.

ZARZĄDZANIE KOMUNIKACJĄ W PROJEKTACH

Streszczenie: W artykule podjęto problem systematyzacji i integracji procesu komunikowania się w projektowaniu i w zarządzaniu projektami. Podstawę do analizy zakresu i formy komunikacji stanowiły wybrane metodyki oraz narzędzia zarządzania projektami. Wyniki analizy wybranych technik i narzędzi projektowania stanowią przesłankę do pokazania koncepcji integracji informacji o rozwiązaniach merytorycznych i informacji zarządczej bazującej na możliwości utrzymywania jednolitego repozytorium projektu i wydobywania z tej bazy niezbędnej informacji o postępach prac przy założeniu operowania jednolitym językiem projektowania (opisu projektu).

Słowa kluczowe: komunikacja, projekt, system, model, metodyka, zarządzanie, narzędzia

BIBLIOGRAPHY

- [1] GRIFFIN R.W., 2003, *Podstawy zarządzania organizacjami*, WN PWN, Warszawa.
- [2] PMI (Project Management Institute), 2013, *The high cost of low performance: The Essential role of Communications*, Newton Square, May 2013.

-
- [3] OGC, 2009, *Managing Successful Projects with PRINCE2 (2009 ed.)*, Norwitch.
 - [4] PMI, 2008, *A guide to the Project Management body of knowledge – Fourth Edition*, Newton Square.
 - [5] CHLEBUS E., 2000, *Techniki komputerowe CAx w inżynierii produkcji*, WNT, Warsaw.
 - [6] KNIBERG H., 2007, *Scrum and XP from the Trenches*, free online version.
 - [7] SUTHERALAND J., 2004, *Agile development: Lessons learned from the first Scrum*, 10.2004.
 - [8] LIGHTFOOT J., BECKETT CH., 2011, *Microsoft Sharepoint 2010 PL. praktyczne podejście*, Helion.
 - [9] PHILLIPS J., 2011, *Zarządzanie projektami IT*, Helion.
 - [10] SCHWABER K., SUTHERALAND J., 2013, *The Scrum Guide*, 8.2013.
 - [11] HAMILTON K., RUSS M., 2007, *UML 2.0: Wprowadzenie*, Helion.
 - [12] JEDLIŃSKI K. et al., 2008, *Trening interpersonalny*, 2nd ed., Warsaw.
 - [13] LOCK D., 2003, *Podstawy zarządzania projektami*, PWE, Warszawa.
 - [14] THOMSON P., 1998, *Sposoby komunikacji interpersonalnej*, Zysk i S-ka.
 - [15] Office of Project Management Process Improvement, *Project Communication Handbook*, Sacramento 2007.
 - [16] ZASKÓRSKI P. et al., 2013, *Zarządzanie projektami w ujęciu systemowym*, WAT, Warsaw.
 - [17] ZASKÓRSKI P., 2012, *Wirtualizacja organizacji w „chmurze” obliczeniowej*, „*Ekonomika i Organizacja Przedsiębiorstwa*” no. 3, Wyd. ORGMASZ, Warsaw, S. 12/12.
 - [18] WILCZEWSKI S., 2011, *MS Project 2010 i MS Project Server 2010. Efektywne zarządzanie projektem i portfelem projektów*, Helion.
 - [19] Redmine.org, *Redmine guide*, <http://www.redmine.org/projects/redmine/wiki/Guide>, 03.2013.
 - [20] Wikipedia, <http://wikipedia.org>, 3.08.2013.
 - [21] Scrum primer, www.scrumprimer.org, 1.09.2013.