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Communication management model- case study in the project of energy efficiency improvement using the RASCI matrix.

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Abstract

In this article, the processes of identification and analysis of stakeholders as well as activities and organizational roles in the form of RASCI matrix were interlinked. The goal was to design a communication management model for the whole life cycle of the energy efficiency improvement project carried out in the research and development centre of an international automotive manufacturing company. Based on the project documentation and interviews with the Project Manager, the Communication Coordinator and selected project participants, communication channels were planned and analysed. They were made conditional on (1) the identification and analysis of stakeholders (the product of which was the stakeholders' matrix); (2) the identification of organizational activities and roles based on a RASCI matrix and (3) a reporting matrix. Based on these tools, a schemes and directions of communication were proposed for each phase of the project. These schemes were created in a graphic forms. The results of the analyses show that the use of the RASCI matrix for planning communication in the project is possible, but it entails certain limitations related to the introduction of possible modifications within the matrix. However, the RASCI matrix can be considered a useful tool for planning and supporting communication in the project.

Keywords: management, communication model; energy efficiency improvement project; RASCI matrix.

Introduction

Intensified development of enterprises, particularly those with international reach, and their processes require effective and efficient action to improve and achieve their sustainable development. One area for such action relates to the need to improve energy efficiency and the introduction of energy management systems. According to Um, Stroud, Park (Um, Stroud and Park, 2019), due to concerns about energy consumption in production systems, interest in introducing energy-efficient actions and processes has increased, also in the automotive industry.

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These, especially in the initial phase, often take the form of projects. Their implementation involves a certain amount of investment and waiting time in terms of balancing their benefits. Each project, therefore, requires a proper approach in terms of analysis and evaluation of its realization potential, and then its proper management. Lack of such an approach and the use of appropriate mechanisms or tools may cause that the incurred outlays will not translate into the planned effects and the assumed objective will not be achieved. One such tool, and at the same time factors crucial to the success of the project, is communication management. Research conducted by PMI (Project Management Institute) shows that organizations that have developed effective ways of communication management in a project finish more projects in the assumed time (71%) and within a budget (76%), compared to organizations that communicate in a less effective way (37% and 48% respectively). Moreover, PMI indicates that 55% of project managers consider effective communication to be a key success factor in the project (Project Management Institute, 2013b). Therefore, it can be assumed that good communication management affects the performance of the organization as a whole. Nevertheless, it is one of the most underestimated and neglected organizational processes (Hargie and Tourish, 2009) (Carvalho, 2014). This seems to stem from the fact that communication is disregarded as an area that connects and coordinates various processes and activities related to project management.

Therefore, the aim of the article is to develop a comprehensive communication management model for the energy efficiency improvement project carried out in the research and development center of an international automotive manufacturing company. Important for the realization of the goal was the assumption that this model, understood as a system enabling communication between key participants, will include 4 elements: people, design information, methods and processes, technological tools and will take into account key participants of the project. Based on project documentation and interviews with the Project Manager, the Communication Coordinator and selected project participants, communication channels, conditional on the identification and analysis of stakeholders and organizational activities and roles, carried out on the basis of RASCI matrix, throughout the entire life cycle of the project - from the initial phase to the completion of the project, were planned and analyzed. The communication management model presented here was designed before the actual start of the project activities.

The role of communication in project management

Literature overview

The importance of communication as one of the factors determining the success of projects is well documented (Pinto and Slevin, 2016) (Fortune and White, 2006) (Alias *et al.*, 2014)(Senescu, Aranda-Mena and Haymaker, 2012). The literature on the subject shows that the lack of properly planned and structured communication may be the reason for the failure of the projects (Carvalho, 2008)(Zulch, 2014). There are many reasons why communication is necessary for effective project management - from a better understanding of the project's objective to eliminating waste of resources and motivating those involved in the project. Effective communication must be structured and properly addressed rather than generic and broad (Feiner and Edward, 1992) and the synchronization of messages, their content and terms is essential (Meredith, Mantel Jr and Shafer, 2017). Effectively used communication reduces non-productive effort, helps to avoid duplication, and eliminates errors (Beavers, 1997), leads to faster identification of problems, and helps to solve them. In addition, it contributes to more effective teamwork, increases motivation, and ensures the involvement of all project participants (Dahle, 1997). Research results allow us to assume that properly planned and implemented communication in the project increases the probability of achieving the goal within the allocated time and resources (Clarke, 1999).

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Research by Ahuja et. al. (Ahuja, Yang and Shankar, 2009) on data flow and communication in projects shows that project managers spend 75-90% of their working time on communication and that it is necessary to achieve the required coordination and cooperation between project participants. Therefore, providing relevant and irrelevant information to all stakeholders is not a reasonable choice (Project Management Institute, 2013a). It is necessary to seek a more diverse approach to communication with different stakeholder groups (Ramsing, 2009). Therefore, project management practice adapts communication procedures and involves different stakeholder analysis techniques (Müller and Turner, 2010). Grouping stakeholders using the salient model (Mitchell, Wood and Agle, 1997) by assigning them three attributes - power, legitimacy or urgency - is one of the most popular tools (Neville, Bell and Whitwell, 2011) used for project communication planning (Yang *et al.*, 2011)(Mok, Shen and Yang, 2015). Project stakeholders, based on their relevance to and impact on the project, are also divided into separate categories in order to design different communication procedures for each group (Olander and Landin, 2005). Communication procedures based on these models are developed, but usually include continual stakeholder involvement throughout the life cycle of the project. However, it seems that the project communication model, firstly, requires more consideration than just stakeholder analysis and, secondly, should be updated throughout the life cycle of the project.

RACI matrices as a communication planning tool

One of the tools facilitating the creation of project teams with appropriate stakeholders across the enterprise, defining their roles and tasks and, what is the most important from the point of view of the article's objective, facilitating planning and communication, is Responsibility Assignment Matrix (RAM), also known as RACI matrix or Linear Responsibility Chart (LRC)(Olander and Landin, 2005). RACI matrices constitute a mechanism to represent the assignment of responsibility of the members of an organization. In their standard modality, they are utilized to associate activities with human resources, typically by using the organizational roles the members of an organization play within the company or given a specific context (e.g. in a specific project). Such matrices provide a way of planning, organizing and coordinating work and represent specific links for each action, such as the person responsible for implementing the action and the persons who need to be informed of the end of the action (Cabanillas, Resinas and Ruiz-Cortés, 2012). RACI matrices are therefore a useful tool to document additional links between activities and organizational roles and to plan, based on these links, the communication process. The responsibility matrix, which defines the nature of stakeholder involvement in the project activities, uses the following roles:

- Responsible (R): a person who must perform the work, responsible for the activity until the work is finished and approved by an accountable. There is typically only one person responsible for an activity.
- Accountable (A): a person who must approve the work performed by the person responsible for an activity, and who becomes responsible for it after approval. There must be one and only one accountable for each activity.
- Consulted (C): this role involves the people whose opinion is sought while performing the work, and with whom there is two-way communication.
- Informed (I): a person who is kept up-to-date about the progress of activity and/or the results of the work, and with whom there is just one-way communication. There may be more than one informed person for an activity (Cabanillas, Resinas and Ruiz-Cortés, 2012).

In project implementation practice, several useful variants extending the functions used in traditional RACI matrices (e.g. RASCI matrices) have also appeared. The present article uses

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exactly this type of RASCI matrix as it includes an additional function that may be of particular interest in cases of energy efficiency improvement projects, where the work or tasks necessary to complete the action can usually be passed on to others. RASCI matrices involve the aforementioned RACI roles together with RASCI role Support:

- Support (S): people who may assist in completing an activity, i.e., a person in charge can delegate work to them. Unlike Consulted, who may provide input information to the activity (i.e., information helpful to perform some work). Support will actively contribute to the completion of the activity (Cabanillas, Resinas and Ruiz-Cortés, 2012).

Methods and data

The empirical context: energy efficiency improvement project

The source of empirical data is an energy efficiency improvement project carried out in a R&D center of an international automotive company based in Poland, Wrocław. The aim of this project is to introduce improvements in the following areas:

- reduction of waste of industrially produced compressed air,
- reducing the consumption of electricity consumed by climate chambers,
- change of refrigerant in existing equipment to the latest EU standards and requirements (current refrigerant shows toxicity, high price, low availability),
- reduction of operating costs for current maintenance, repair, and maintenance of test units,
- reduction of workload and costs related to the preparation and implementation of tests,
- limiting the number of climate chambers used for testing,
- improving the organization of work for the use of climate chambers,
- limiting the failure rate of equipment units.

Research assumptions

In compliance with the adopted research assumptions, the designed communication management model has been defined as a system enabling communication between key participants, taking into account 4 elements: people, project statements, methods and processes as well as technological tools.

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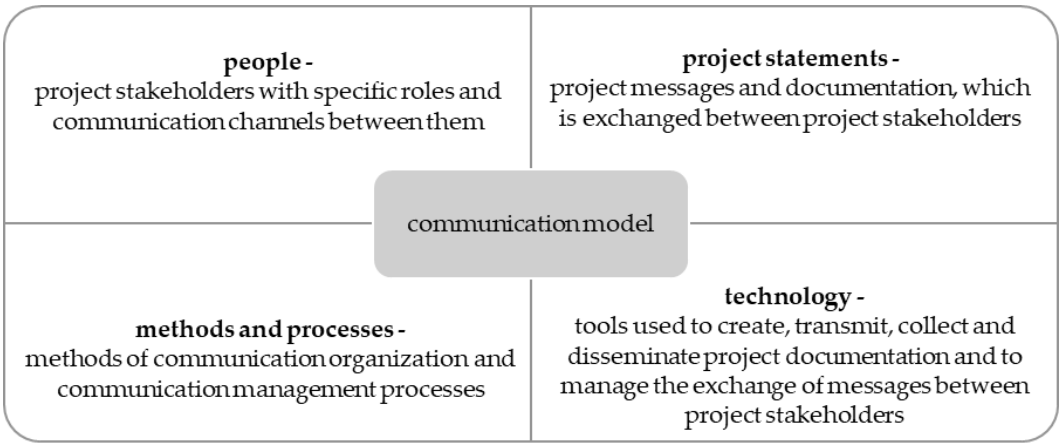

Fig 1. Communication model in the project

The components of the model presented above speak to its complex character - it includes organizational, informational, methodological and technological aspects. All these areas must interact with each other in order to ensure effective project communication.

The process of building a communication model in the analyzed project has been divided into four stages:

1. identification of key project stakeholders and communication channels between them,
2. determination of the information content of identified communication channels,
3. defining the rules of assigning ICT tools and techniques to communication channels,
4. visualization of the communication model.

Another assumption was the need to encompass the entire life cycle of the project within the model so that the model supports communication in the project at each stage of its implementation. This approach makes it possible to emphasize the importance of a comprehensive approach to communication management in the project. Moreover, it was considered necessary to include all key stakeholders in the model, assuming that their proper identification is an important factor which may determine the success or failure of the project. Their identification was complemented by an analysis of activities and organizational roles based on the RASCI matrix.

Research methodology

The main form of data collection was semi-structured interviews with the Project Manager, the Communication Coordinator, and selected project participants (7 persons), conducted in May 2019, as well as the analysis of project documentation. On the basis of these data, the identification and analysis of stakeholders were carried out first, constructing a stakeholder matrix whose product was the Responsibility Assignment Matrix describing the project stakeholders, taking into account their characteristics and strength of impact. Then, a reporting matrix in a simplified form was developed, taking into account the sender, recipient, exemplary type of sending and receiving messages, and frequency of reporting. On the basis of these tools, a schemes and directions of communication were proposed for the initiation, implementation and completion phases of the project. These schemes were generated in a graphic form.

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Results

Stakeholder identification and analysis

In almost all current project management methodologies, it is assumed that participants from the immediate or more remote environment of the project or those who can influence the project - stakeholders - will have to be taken into account. The Project Manager was responsible for carrying out such activities in the analyzed case study. The aim of stakeholder identification and analysis was to identify and understand the requirements and needs of individual project participants, and to identify their impact on the project, expectations, main goals, can-do for solving problems, and the importance of their position in the permanent structure of the organization. Stakeholder analysis in project communication management is a key element of identifying information needs and establishing communication channels. In this context, it is important to manage stakeholder involvement, monitor stakeholder relations and ensure that communication can be modified during project implementation.
In order to identify stakeholders and create a matrix of stakeholders, data collected during interviews with the Project Manager and the project team as well as data from the analysis of project documentation were used. On this basis, the main stakeholders, relevant from the point of view of the project, and those involved in the project, were identified first. These are:

- General Manager of the company where the project is carried out
- Director of Building Maintenance
- Top Project Sponsor - Head of R&D Testing throughout the organization
- Sponsor of Technology Implementation in R&D throughout the organization
- Integration of R&D Teams Expert in Poland
- Implemented Technology Expert
- Local Test Team Coordinators (located in 3 different countries: Poland, Germany, and India)
- Project Manager
- Finance Coordinator in the project
- Communication Coordinator in the project
- Members of the Test Teams (Test Engineers)
- Equipment and technology suppliers (external companies)
- Customers (internal and external) of R&D products
- State administration and environmental protection authorities (issues related to control of refrigerant).

Based on this list, which was verified during the interviews, a matrix of key stakeholders (see Table 1) was developed, taking into account their characteristics, description of their relationship to the project, and in addition, the project manager synthetically defined their strengths and weaknesses and potentially possible conclusions for the management of both project communication and in general the whole project.

Table 1. Matrix of project stakeholders

Stakeholder	Characteristics	Description of the relationship to the project	Strengths and weaknesses	Conclusions for the project

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Top Sponsor (Steering Committee)	Decision- making authority for all regions	Advocate	Openness and commitment	High impact
Technology Implementation Sponsor (Steering Committee)	Decision- making authority and influence in superior R&D units	Neutral	Experience	High impact
Team and Personnel Expert and Integrator (Steering Committee)	Decision -making authority in R&D Poland	Advocate	Experience, negotiation skills	High impact
Technology Expert	System-wide knowledge	Advocate	Burdened with team leadership in a fixed structure	Medium impact
Financial Coordinator	Analytical approach to problem-solving	Advocate	Commitment and workload in a fixed structure	Low impact
Communication Coordinator	Insight, high emotional intelligence	Advocate	Openness and commitment	Low impact
Local Coordinator (Poland)	Performance-controlling, a strong motivator, coercive management style.	Neutral	Commitment, determination, activity in action	Medium impact
Local Coordinator (Germany)	Decision-maker within the team	Neutral	Lack of data	Low impact
Local Coordinator (India)	Decision-maker within the team	Neutral	Lack of data	Low impact
Test Team Leaders	Team-level decision making	Negative	Burdened with team leadership	Low impact
Test Team Members	Decision-maker within the team	Neutral	Burdened with teamwork	Low impact

RASCI Matrix

The product of the stakeholder analysis was the RASCI responsibility matrix (see Table 2). This matrix determines the roles and persons responsible for the main activities in the project. It is an important stage in the analysis of the communication process in the project, before establishing the paths and channels of communication, because it indicates who should cooperate with whom, who implements a given activity, who approves it, who is consulted with whom, who can support a given implementation. The Project Manager, after consulting with individual supervisors and members of the project team, defined the responsibilities of the team members. This division of responsibilities takes into account the roles of collaborators, validators, consultants and those who are informed about the results and findings. This matrix, which was created before the launch of the project and approved by individual members of the project team, should be updated throughout the project, in order to update the responsibility of people for the task.

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Table 2. RASCI Matrix[1]

Actions	**Roles**									
	Project Manager	Top Sponsor	Sponsor of Technology Implementation	Expert and Integrator of Teams and Persons	Technology Expert	Financial Coordinator	Communication Coordinator	Local Coordinators	Test Team Leaders	Members of the Test Teams
Project planning	A	I	C	C	I	C	C	C	I	I
Budgetary planning	A	R	C	C	A	C	I	A		
Identification of risks	R	C	C	C	S	S	I	S	S	S
Project launch	A	R	A	A	I	I	I	I		
Monitoring of the project budget	C	A	I	I	S	C	I	I		
Monitoring of the status of the project	R	I	I	I	S	I	C	S		
Negotiations with the suppliers	S	I	I	I	R	I	I	S		
Selection and ordering of devices	S	I	I	I	R	I	I	C		
Implementation and integration	I	I	I	I	R			C		
Connection of climate chambers	S	I	I	I	R	I	I	I	I	I
The launch of the equipment management system		I	I	I	C	S	I	S		
Project settlement	A	C	I	I		R	I			
Communication coordination	A	C	I	I		I	R			
Financial coordination	A	C	I	I	S	S	S	S	I	I
Supervision over technical documentation of testers	I				C				C	R
Construction of testers	I				C				C	S
Performing connections and tests of devices	I				C				C	S
Conclusion and summary of the project	A	R	C	C	S	I	I	I	I	I

Communication Model

[1] (R) - Responsible; (A) – Accountable; (S) – Support; (C) - Consulted; (I) – Informed;

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In the developed communication model a number of assumptions were made, the most important of which concerned: determination of communication channels, the definition of key communication participants, identification of information and communication needs. In the communication model, the use of key IT tools dedicated to the exchange and registration of messages, statements and information was also defined. Based on these data, the Reporting Matrix in a simplified form (see Table 3) was first developed, including the sender, recipient, exemplary type of sending and receiving messages/ statements and frequency of reporting. Then, on the basis of this matrix, schematics and structure of communication channels in the analyzed project were designed.

Table 3. Reporting Matrix

Sender	**Recipient**	**Content of the message/ statement**	**Reporting frequency**	**Expected answer**
Project Manager	All project implementers	Status of works Designation of tasks	Once a week	Information on the progress of the work and planned activities
	Test Team Leaders	Problems and difficulties in the existing system	If necessary	Acknowledgement
Steering Committee (Top Sponsor, Technology Implementation Sponsor, Expert and Team and Person Integrator)	Project Manager	Possible support in the project implementation	If necessary	Method of support/ solving the problem
Technology Expert	Project Manager	Status of technology implementation	Once a week	Status of the work, possible problems
Financial Coordinator	Project Manager	Status of works commissioned by the Project Manager	Once a week	Current status of the work
Communication Coordinator	Project Manager	Status of works commissioned by the Project Manager	Once a week	Current status of the work
Local Coordinators (Poland, Germany, India)	Project Manager	Status of works commissioned by the Project Manager	Once a week	Current status of the work
Test Team Leaders	Koordynator Lokalny lub Project Manager	Status of works commissioned by the Project Manager	Once a week	Current status of the work
Test Team Members	Test Team Leader	Status of works commissioned by the Project Manager	Once a week	Current status of the work

Schemes and structure of communication channels

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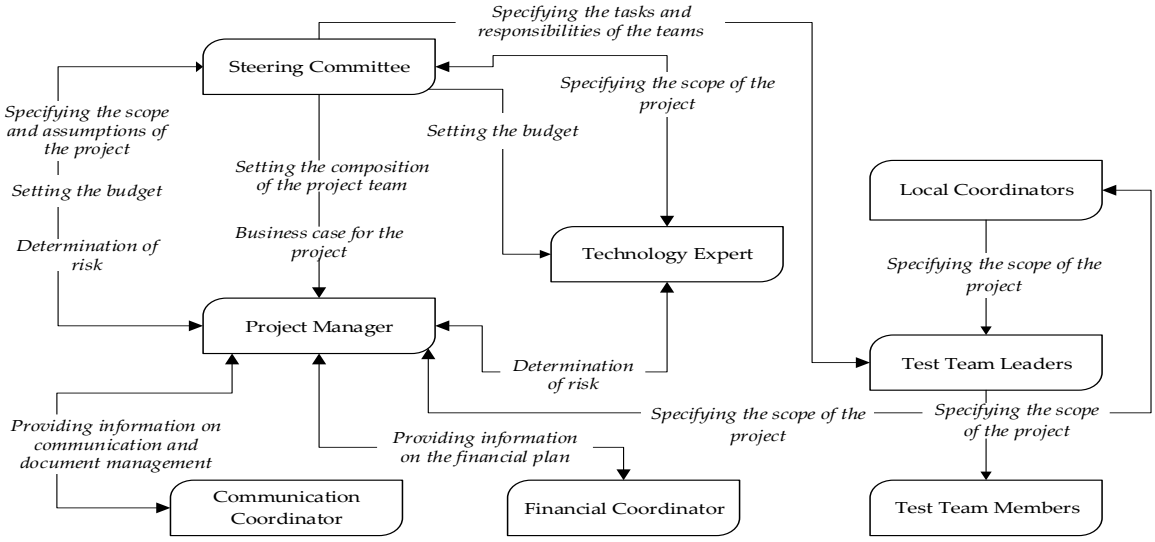
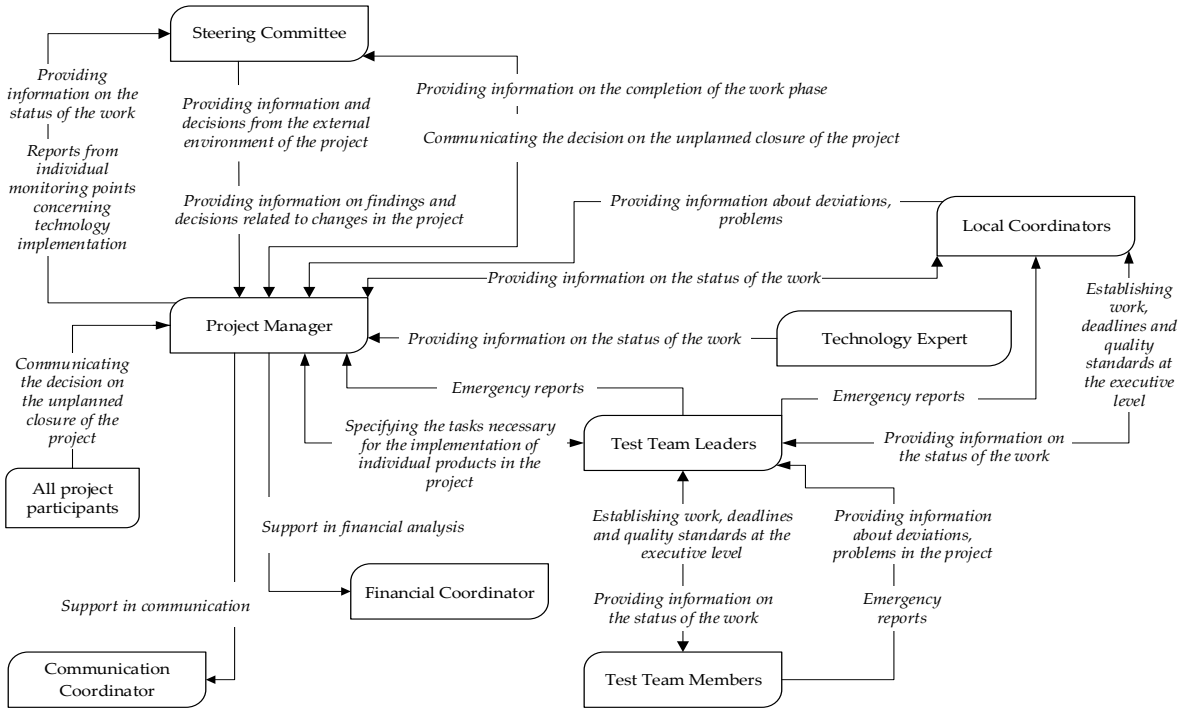
Based on the collected data described above, in close consultation with the Project Manager and the Communication Coordinator, the schemes and structure of the communication channels were proposed and developed for the three phases of the project: initiation, implementation and completion. These tools were developed both in tabular and schematic form.

Scheme 1. Scheme and directions of communication - project initiation phase



Scheme 2. Scheme and directions of communication – project implementation phase



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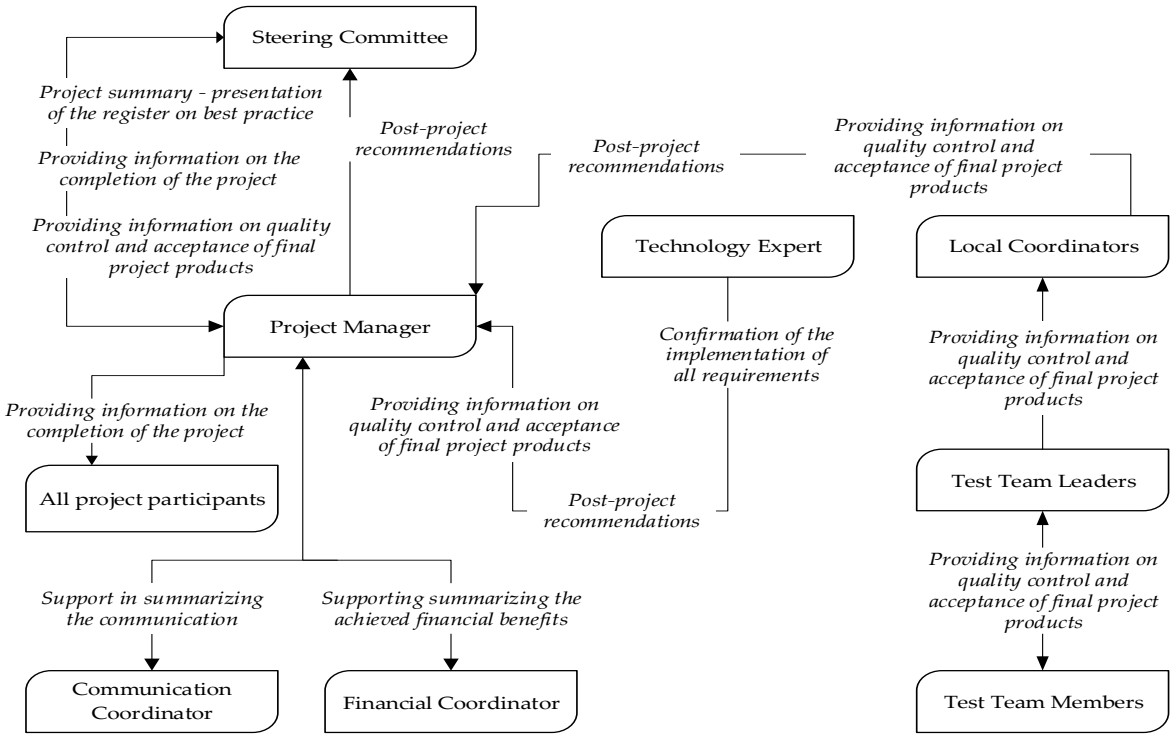
Scheme 3. Scheme and directions of communication – project completion phase



Discussion

Based on the case study analysis it can be concluded that the use of the RASCI matrix for planning communication in a project is possible and can be very useful. This can help not only in planning the communication process but also in planning, organizing and coordinating the activities necessary for the implementation of the project. However, this approach has some drawbacks: firstly, modifications to the RASCI matrix (e.g. adding or removing roles of RASCI in some activities) may entail important changes in the communication model. Particular attention should, therefore, be paid to the identification and analysis of stakeholders, which should ensure the relative stability of the matrix. Secondly, the proposed approach, apart from being based on the analysis of one case study, is additionally limited to projects carried out within one organization. Therefore in the future, it is necessary to analyze different alternatives, not only for communication planning in other companies but also for inter-organizational projects. Thirdly, in order to increase the potential of introducing energy management systems, it may be important to apply the RACSI matrix and, as a result, the communication model to the company's non-design activities. Therefore, the method of communication planning proposed in the article is a starting point, which should be further tested.

Summary

Project communication management based on the analysis of roles and organizational activities is a rather neglected research area. A number of studies can be identified that show communication planning and management, including stakeholder identification and analysis. There are also other known studies which take into account responsibility matrices. However, most of them focus on

the identification of resources responsible for process activities, ignoring other important roles that are used daily in companies and in their projects. Here, the idea of RACI matrix appears as a mechanism representing tasks related not only to the performance of activities, approval of work done and transfer of results but first of all to the analysis of the links between activities and organizational roles, enabling planning and communication in the project.
The processes of identification and analysis of stakeholders as well as activities and organizational roles in the form of RASCI matrix are connected with each other in this article. The aim of this paper was to design a model of communication in the whole life cycle of the project - from the initial phase to its completion. In that, taking into account the fact that communication is identified as one of the success factors of the project, the chance for successful implementation of the analyzed project increases, which may translate into the introduction of a comprehensive energy management system in the company. In order to open the possibility of continuity of activities undertaken to increase the energy efficiency of enterprises, it is necessary to demonstrate the impact of feedback showing that the existing project has, or may have, an impact on future energy efficiency (Chai and Yeo, 2012). It is also important because today, one of the most important challenges facing manufacturing companies is to ensure sustainable business development, and in particular responsible use of resources, such as energy (European Parliament, 2012)(European Commission, 2014).
In the author's opinion, the developed communication management model, including stakeholder analysis and the analysis based on the RASCI matrix, may also constitute a valuable contribution to communication management for organizations whose employees are members of the team. It can also be used as a practical tool in the communication process for other team members. The implementation of this model does not generate high costs and does not require additional skills from the users. However, it may positively influence the systematization and synchronization of communication not only in the case study but also within the whole company.

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