MANAGEMENT OF RESEARCH PROJECTS – LESSONS LEARNED

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Abstract: Project management assists many areas of human activities and recently has been considered as a way to ensure the success of scientific research projects. A primary problem is the need to identify the project's success factors, which include phenomena, actions, events, and parameters that contribute to the success. The purpose of this study is to identify the management issues and oversights that pose a negative effect on scientific research projects. The study involves a questionnaire, distributed to several managers of research projects conducted within Polish universities. This paper presents the results of assessing responses to two questions of this survey. These questions about project management deal with goals achieved by marginal projects and an analysis *ex post*. The responses to each question are grouped into five types, on which a frequency analysis is performed. For each group, several conclusions and recommendations are proposed. The results are a first attempt to construct a set of suitable practices for the management of scientific research projects.

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Introduction

There has been growing interest in project management of scientific research. The issue has remained neglected for many years, leaving the management of scientific research projects lagging behind that of other areas such as information and technology. Awareness is needed on the history of project management and the specifics of research projects since those requiring a high level of innovation and creativity may not fit within the rigid framework of algorithms and quantitative tools.

The work conducted in this paper is empirical, based on the experiences of many scientists who implement and manage scientific projects, and results from the scientist's perceived need to change. The intention is to find the starting point for future development of project management research, or at least to identify a set of 'good practices' in this field. The aim of the work is to show the areas considered unfavorable for research projects where appropriate improvements could lead to eliminate the most common mistakes for better project management in the future. The target audience includes individuals managing scientific research projects, as well as other stakeholders.

Literature Review

Success and Failure in Research Project Management

There exists broad divergence of opinions on the subject of what constitutes 'research project success.' Success, considered primarily as project success in general and not only in reference to research projects, refers traditionally to three basic criteria for successful projects in an 'iron triangle' or 'golden triangle': cost, time, and quality (Atkinson, 1999; Baccarini, 1999; Cheng, Tsai, & Sudjono, 2012). In general, the understanding of a successful project appears obvious and yet, project management literature reveals inconsistencies of an omnifarious nature. As Cameron (2016, p. 1) writes, relatively little systematic attention has been given in the literature to the meaning of "success and failure of research/innovation projects." For formulating assessments of success and failure, there is a need to define the nature of the notions in more detail. Considering the impact of particular research project, Cameron (2016, p. 6) argue that "research projects must be judged on their longer term programmed effect, perhaps on a stream of products which take time to manifest their full impact" and analogously "take a longer term of the results of a new innovation" instead of restricting assessment to a single product. Success and failure are always relative concepts in the sense that a project can generate significant revenue even if its status is 'failed', as demonstrated in Cameron's work with the case study of Betamax versus Video Home System (Video Home System; Buisseret, Cameron, & Georghiou, 1995; Cameron, 2016). Gryzik and Knapińska (2012) in their broad study of research projects claim that there is no universal way to manage a research project to guarantee success. The nature of the project, its environment, competencies, and predispositions of the team, and team skills of the manager need to be taken into account. According to Gryzik and Knapińska (2012),

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delays, overruns, lowering the quality of the work, and the inability to continue project arise from the following:

- Incorrect or no specification of the roles and responsibilities of the project team;
- Lack of rules and channels of communication within the team; and
- Inefficient planning (creating overly generalized plans prevents the functioning of management, and exceedingly detailed plans are unrealistic to execute within the given time).

Research project management literature offers some important guidelines as success criteria for research projects. Kamińska (2014) argues that evaluation of the project should be based on the following criteria:

- Relevance (the process of project implementation is correct, according to identified problems);
- Efficiency (the extent to which its objectives are realized or steps and actions are taken to fulfill the objectives and implementation indicators contained in the logical framework);
- Effectiveness (the measures taken are effective and lead to the growth of innovative research and development projects or create a new business start-up or spin-off; what has been achieved, was also planned);
- Perception (the project meets the expectations of stakeholders; academic, business and public community perceive these activities as helpful and contributing to the development of their regions); and
- Durability (the extent to which the beneficiaries of the target have a wider overall impact on other regions in terms of innovation and entrepreneurship.)

Interesting conclusions are formulated by Lazzarotti and Manzini (2011), who raise a formal model for assessing success and failure of research and development (R&D) projects. The model is based upon a balanced and synthesized evaluation of quantitative indicators from five different perspectives of performance: financial, customer, innovation and learning, internal business, alliances, and networks (Lazzarotti, Manzini, & Mari, 2011). A similar formal model for measuring R&D performance was proposed by Cameron (2016) who writes about dimensions for creating a typology of criteria for assessing success and failure of research projects. According to this author, based on four dimensions, 11 different types of criteria should be defined, among which 38 criteria should be differentiated. Then, a subjective opinion is formed on the importance of each type of criterion from three perspectives: commercial, customer, and social and environmental. In this model, Cameron (2016) formulated these criteria: accounting and financial measures, market-based, counterfactuals, technical or market innovativeness, time, technological performance, standards, environmental, competence, skills, research results, productive capacity, and social impact.

Data and Methodology

The research was conducted by a project team at the Department of Computer Science and Management, Wrocław University of Science and Technology. The project team's objective was to apply success factors to Polish scientific research projects. Forty-two research project managers were involved. A questionnaire of 58 open and closed questions was developed and addressed to these managers, who supervised research projects at Polish scientific institutions. This paper focuses on the following two questions asked of the managers:

A. Did you find any side-effects of the project (both favorable and unfavorable)?
B. If you had the opportunity, what would you change in project realization (e.g., organizational structure, schedule, budget)? Why?

Results and Discussion

Question A was answered by 15 respondents (33%), who listed 13 side-effects. Statements, quoted literally, are grouped into 5 types of side-effects:

1. Scientific research side-effects (6 posts; 40% of all answers)

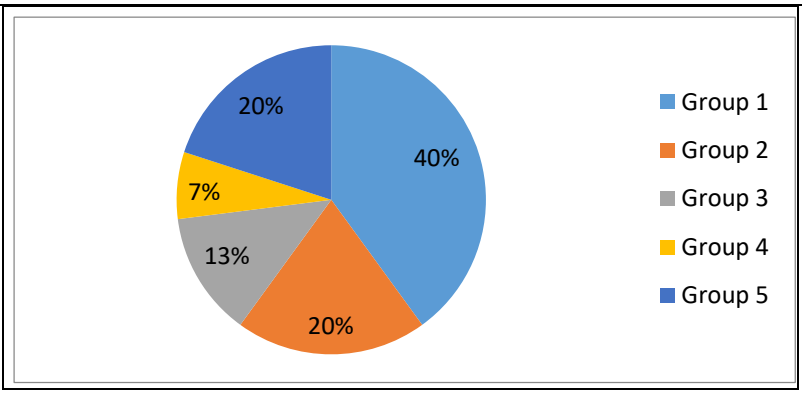
- new projects
- new doctorates
- development of a new technology
- other side-effects in terms of scientific research
- the unexpected discovery of interesting properties of protein

- noticed a pattern which we would like to examine later on

2. Context side-effects – relationship with the external environment (3 posts; 20% of all answers)
   - established beneficial contacts and co-operation for use in future projects
   - beneficial cooperation, further projects
   - cooperation with INCO company
3. Personal development side-effects (2 posts; 13% of all answers)
   - new ideas
   - increase creativity
4. Behavioral side-effects – internal relationships in the project team (1 comment; 7% of all answers)
   - the team, although skilled, cannot work together due to character differences
5. Other – negative (3 posts; 20% of all answers)
   - only 50% of the project objectives achieved
   - renouncement from further research
   - the problem with the use of materials

Figure 1 shows the proportional distribution of these responses according to the five groups.

Figure 1: Distribution of answers to question A about side-effects given by 42 research project managers



Group 1: Scientific research side-effects
Group 2: Context side-effects
Group 3: Personal development side-effects
Group 4: Behavioral side-effects
Group 5: Other – negative

Source: Authors

Question B was answered by 38 respondents (90%) proposing 42 amendments. Statements are quoted literally and classified into five proposal types:

1. Change of administrative procedures (18 comments; 42% of all answers)
   - formalization level of the application process was too high
   - any change to the project required submission of the application, long time waiting for a response (2–3 months)
   - cooperation with the administration (contact with only one person was flawless)
   - difficult to prepare the correct application in accordance with the requirements, a lot of applications rejected, complicated procedures
   - I would expect (Polish National Science Centre (NCN) gives the opportunity of expression to the project team
   - there was a possibility to submit an official letter, but there is no opportunity to comment on the criteria for evaluation
   - I would like to make some comments to NCN if they see that some people have similar demands, then maybe they could see it is worth looking at it
   - the most important factor is administrative support

- amateur activities related to the selection of adequate reviewer
- too formalized procedures
- incompetent reviewers
- too much bureaucracy and too little interest in scientific values of the project
- in new projects, no one can be paid for their work, this possibility disappeared
- bureaucracy in NCN projects
- better placement of project in the direction of financing and supporting institutions; implementation of the project in the institution, which supports the administrative project manager
- support of other units of the University
- administrative support
- NCN should consolidate the scientific community, and not support unhealthy competition

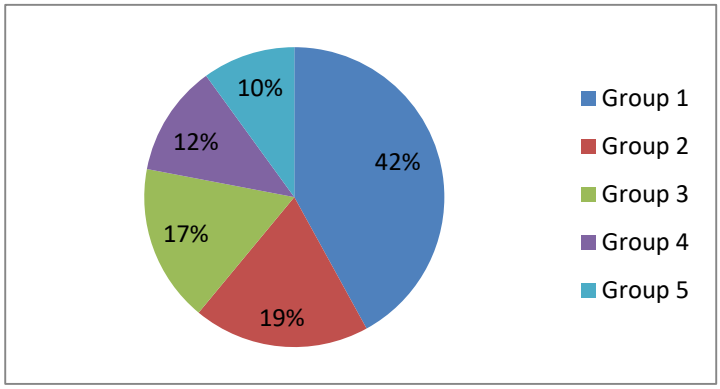
2. Project management (8 comments; 19% of all answers)
   - I would re-define project goals
   - independence in search of contractors, translations
   - organizational changes
   - the project should be realized as a consortium
   - disclosure of research results should not take place
   - the amount of research topics should be limited. Otherwise, funds are dispersed
   - management should be more professional
3. People in the project (7 comments; 17% of all)
   - more contractors, tighter control of results
   - the way of managing people should be better
   - manager predispositions
   - the most important factor is an efficient team
   - larger team
   - improve the recruitment of team members
   - personal relationships with managers of academic units
4. Other resources (5 comments; 12% of all answers)
   - bigger budget
   - budget changes
   - financial support
   - greater importance should be attributed to budget planning, which will be implemented in the next project
   - the budget was ‘not enough’
5. The duration of the project and scheduling (4 comments; 10% of all answers)
   - more time needed
   - schedule
   - longer duration of the project
   - better allocation of tasks to consortium members

Figure 2 shows the proportional distribution of responses according to the five groups.

Only every third respondent claimed to experience side-effects. The classifying of responses distinguished five groups relating to side-effects. The result was dominated by research side-effects (40%). This outcome confirmed a general opinion among the Polish scientists that an essential attribute of a research project is its high unpredictability in outcomes. Thus, possibly an agile approach would benefit research project management. At this stage, the question remains open as to whether it is better to use a well-known agile methodology, develop a new, universal agile approach or use a specific agile type as may be required in a variety of research projects. Context side-effects or otherwise external relationships (20%) rated as the next highest response group for Question A, alongside negative side-effects (20%). Project managers stated side-effects involved establishing new

valuable contacts and cooperating with other research centers and enterprises. Negative side-effects related to the partial failure of projects. Possibly, managers need to focus more on risk management of research projects. The remaining responses to Question A related to personal development (13%) and behavioral goals (7%).

Figure 2: Distribution of answers to the question B on proposed changes as given by 42 research project managers



Group 1: Change of administrative procedures
Group 2: Project management
Group 3: People in the project
Group 4: Other resources
Group 5: The duration of the project and scheduling

Source: Authors.

The manager's responses regarding suggested changes for managing future projects (Question B) were mostly about administrative procedures (42%). This outcome reflects the general opinion within the scientific environment that scientists perceive excessive formalization and complicated administrative procedures as a major obstacle inhibiting proper realization of research projects. Among the eighteen statements in this group, most pertained to NCN, though there were also comments about the internal administration. The second most popular response group for Question B referred to the management of the project (19% of opinions). This area covers various aspects of management. The result reveals that management problems occur and are recognized. The third group referred to people in the project (17%), including aspects of leadership abilities of the project manager, selection of team members, and the team members' work in the project. A relatively high awareness of the effect of personnel ('soft' resources) in the outcome of the project was evident. This was followed by other resources (e.g., budget; 12%) and then the time and scheduling group (10%), which is considered 'hard (hard means measurable, like time, quality, money, risk)' resources. This shows that the 'hard' resources are necessary, though not of primary importance.

Conclusion

The study serves an empirical point as it examines the experience of 42 managers of research projects, in the area of achieving the objectives of projects, unexpected side-effects, and ex-post analysis of the project in terms of "what would I change in management of the already ended project?" The research component presented in this paper is relatively small, being part of a larger NCN project that is ongoing. More research results are expected as the project progresses. Nevertheless, already a predominant direction of the desired changes in managing research projects is visible, though further research is necessary to substantiate these findings.

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