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Data-based Analysis of Experience as an Influence on Focus in Project Execution Phases

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Abstract: Project management models and guidelines focus on standardizing and describing which kind of tasks project managers need to perform and how to perform these tasks. While these frameworks detail such activities, they do not cover how much project managers should perform different tasks depending on their particular project phase and other factors like project size and experience of the team. This article is based on the concept of multivariate regression and optimization being used to improve Project Process Relevance Factors as described in the Ph.D. thesis "Optimized Tailoring of Agile Project Management Frameworks - From Combining Scrum and PMI towards Multivariate Optimization" by Philipp Rosenberger (Rosenberger, 2022). The doctoral dissertation provided the data and scientific approach that was utilized as well in this article. The purpose of the research is to examine how project experience affects the project management activities that must be completed throughout the execution phase in order to optimize the health and success of a project. The data analysis indicated significant similarities in the distribution of emphasize between novice and skilled project management practitioners. After optimizing the distributions of relevance, the results indicate that experienced project managers need to concentrate more on supporting the project process as such. This involves conducting risk responses and overseeing stakeholder participation. In contrast, novice project managers should to focus on managing specific outcome-related project tasks.

Keywords: Project management experience, Process optimization, Multivariate regression

Introduction

Project management requires diverse tools, skills, and approaches. Based on the uniqueness of projects, the international project management framework offers different certificates, guidelines, and modules to manage projects effectively. Some of the common frameworks are the project management body of knowledge (PMBOK) (PMI, 2017), the ICB4 of the International Project Management Association (Dittmann, 2021), and the PRINCE2 framework of Axelos (Axelos, 2017). Mostly, frameworks show the distinct kinds of tasks needed to be fulfilled by any project manager. The amount of focus and effort that managers must exert to accomplish various tasks is a crucial yet often neglected aspect.

The hypothesis of this article elaborates that experienced project managers distribute their focus and work in a project in different ways than inexperienced project managers. The approach and concept for maximizing project success and optimizing project relevance distributions is described and proven to be applicable in the Ph.D. thesis of the main author (Rosenberger, 2022), where he proposed an optimized distribution of project process relevance factors in continuous processes of the PMBOK project execution phase. This paper shall provide orientation for experienced and inexperienced project managers to make a proper distribution in focus, and they can optimize their distributions to tailor their way of working to their level of experience.

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Definitions Based on Literature Review

This paper focuses on implementing mathematical techniques such as optimization and regression that define the optimal approach for diverse project mapping depending on discrete profiles for project managers. The optimization is implemented on collected data from the participants from various fields in project management. It is important to clarify various terms and definitions before describing the methods used (Rosenberger, 2022).

Project Process

The sixth version of PMBOK delineates forty-nine distinct project processes that serve as a guideline for the project management framework. These processes guide the project managers to shape their daily work and tasks, such as risk analysis using appropriate techniques, i.e., fuzzy method (Takacs, 2010.), and PRISM (Bognar, 2021) based methods that control the stakeholder's engagement and the overall budget. Project processes behave like a tool cabinet filled with activities and methods to be utilize by project managers.

Relevance of Project Process

For the fundamental basis of the hypothesis, this research concludes that project managers constantly make decisions about how much time and focus they distribute into different tasks to be performed. Therefore, "project process relevance" is defined as how much time and focus a project manager requires in any specific project process.

Project Process Relevance Distribution

As an input factor to the multivariate optimization, project process relevance distributions are used. An online survey was conducted among inexperienced and experienced project managers, and the questions were asked about tasks that were relevant to managing their projects. The different amounts of effort put into the different tasks of project process relevance forms a final distribution when combined. It has to be mentioned, that not all project processes of PMBOK are applicable in this research. Only the processes of the execution phase are in scope.

Project Health Factors

For optimization output, this article uses factors, considering the measurement of the project's current health. Success as a single concept is not used because it depends upon many different influence factors related to ongoing projects. Further, success is a state after finishing a project. The survey however investigates ongoing projects, making the term project health more suitable as an output variable to be optimized. The interviewed project managers had to estimate the current status of the schedule, budget, scope and customer satisfaction (Varga & Csiszarik-Kocsir, 2019). These four factors of project health are combined into a single output that serves as factor for the aimed optimization. Converting different responses into a single answer is based on the research of Khuri and Conlon (Khuri & Conlon, 1981). Constrained optimization elaborates that this single output for leading and remaining for constraints are not used because multiple project health factors have the same importance in the project's success (Del Castillo & Montgomery, 1993).

Definition of Optimization Focus

PMBOK, developed by the Project Management Institute (PMI) underscores the significance of processes, tasks, and documentation (Matos & Lopes, 2013) for the stated research framework. However, it neglects soft skill activities, which often pose a challenge in terms of objective evaluation. According to PMI, they currently have 700,000 active members (PMI. 2017).

The present survey has been conducted among participants actively engaged in specific projects, which necessitated the selection of a pertinent project phase for the purposes of this research. Although planning has been identified as a critical factor for successful project management (Gyorgy, 2006), the execution phase, which accounts for the majority of project work and spans over a considerable duration (Project Engineer,

2021), has been deemed most appropriate for this research. Furthermore, the availability of pre-existing data collected during the Ph.D. research project enables addressing the stated question. Eight of the ten pertinent processes conducted during the project execution phase are ongoing. The following optimization is based on these processes.

Below is an overview of these processes along with the corresponding identification numbers pertaining to the chosen execution phase (PMI, 2017):

- Process P1 “Direct and Manage Project Work”: Defines the process of directing and executing activities specified in the project management plan while applying approved adjustments into practice to meet project objectives.
- Process P2 “Manage Project Knowledge”: Is the approach of achieving project goals and advancing organizational learning by making use of current knowledge and creating new expertise.
- Process P3 “Manage Quality”: The quality management plan serves as the basis for executable actions that incorporate the organization's quality guidelines into the project.
- Process P4 “Develop Team”: This approach strives to improve teamwork, interpersonal competencies, and general team atmosphere to increase project performance.
- Process P5 “Manage Team”: To enhance the project's overall performance, this process entails monitoring the team's performance, issuing input, addressing problems, and supervising team transformations.
- Process P6 “Manage Communications”: Project information must be developed, shared, stored, collected, controlled, tracked, and subsequently disposed within an appropriate and feasible form.
- Process P7 “Implement Risk Responses”: This process aims to put the established strategies for responding to risks into execution.
- Process P8 “Manage Stakeholder Engagement”: Working and cooperating with stakeholders to satisfy their requirements and standards, address problems, and foster appropriate stakeholder participation are the objectives of this task.

Four project health factors contribute to the optimized outcome. These factors are based on the traditional project management triangle of cost, scope, and time (Wyngaard, 2011) enriched with an additional factor of customer satisfaction. High client satisfaction, particularly in IT projects, can result in project success despite the fact that the scope, budget, or timeline are not fulfilled (Atkinson, 1999).

Sampling Procedures

The data set was acquired through personal inquiries at conferences and networking events, emails issued to a community of graduates from the UAS FH Campus Wien master's course "Technical Management," and posting invitations to project management practitioners on social media channels like Facebook and LinkedIn. Participants might be anyone who has worked in project management in any capacity in the past or present. Furthermore, even if they did not work in management, current students at the partnering institutions in Budapest and Vienna who had prior job experience in these fields were welcome to take part.

For this research, a rudimentary understand of project work and the PMI project methodology was sufficient. Over the duration of eighteen months, an estimated six hundred invitations were sent out, and 103 genuine and legitimate survey replies were received. By guaranteeing the inclusion of participants with varying degrees of expertise in the study, applicants with disparate perspectives on project management were able to provide a diverse range of opinions.

Questionnaire Design

A specially designed, cloud-based data collection web portal was used to conduct the actual data gathering (Heroku, 2023), as pre-packaged survey software solutions lacked the capability to disseminate relevance factors. The survey conducted can be accessed via the link https://agile-projects-survey.herokuapp.com/home.

The survey participants also shared details about their projects and backgrounds, in addition to the distributions of project health variables as output parameters and project process relevance as input variables. Except for the section that follows, which summarizes the qualities of the participants, these extra characteristics are not acknowledged as such in the research findings.

Respondents

There were 103 valid replies in total. Men form 73% of the participants, while women make up 27%. Out of the participants, 22% are older than 40, 33% are between the ages of 30 and 40, and 45% are between the ages of 20 and 30. 83% of the participants hold a university degree, and 51% have worked as project managers or sponsors. Also, 51% of participants are employed in management and business in the financial or IT sectors. Of the participants, 52% use either hybrid (Tolbert & Parente, 2020) or agile (Ashmore, 2014) project management frameworks. On a Likert scale of 1 to 5, where 5 represents "very experienced project management skills" and 1 represents "novice project management skills", 69 (67%) out of the 103 participants assessed their project experience as a 4 or a 5. The study that follows summarizes this group as "Experienced". The remaining participants gave themselves a rating between 1 and 3. This group is referred to as "Inexperienced".

Initial Analysis of Process Relevance Distribution in Dependence of Project Manager's Experience

The following section compares the project relevance distributions before optimization to get a first understanding of the difference between the focus distribution of the aforementioned groups “Experienced” and “Inexperienced”.

Table 1. Collected (not optimized) distribution values for different self-evaluations

	“Experienced”	“Inexperienced”
Process P1	19%	19%
Process P2	14%	15%
Process P3	10%	12%
Process P4	8%	8%
Process P5	14%	11%
Process P6	15%	15%
Process P7	9%	9%
Process P8	11%	11%

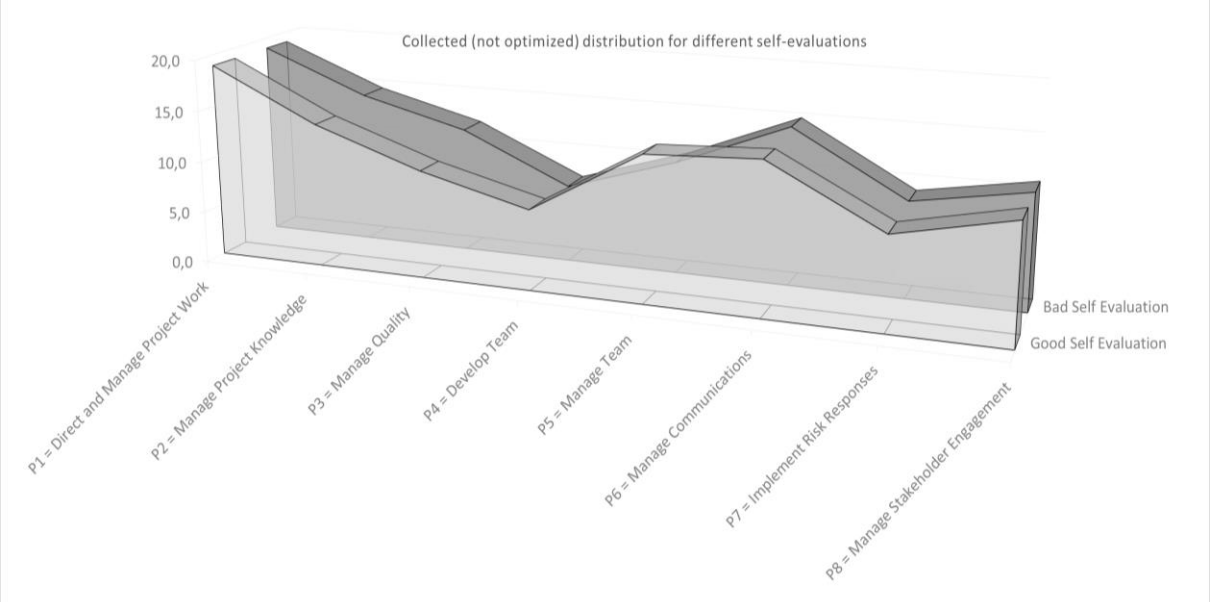

Figure 1. Distribution for different self-evaluations (not optimized)

Comparing the different project process distributions, there are only minor differences. Experienced project managers tend to put slightly less effort into project processes such as "Direct and Manage Project Work", "Manage Project Knowledge", and "Manage Quality", and therefore focus more on the "Manage Team" project process. The group of less experienced project practitioners execute the processes analogously.

The next step is to use the collected data from experienced and inexperienced project managers to optimize project health and success. To enhance project health, the four project health indicators were added together, divided by four hundred, and then the reciprocal value was calculated using the MATLAB R2018b minimization solver.

Analysis of Optimized Process Relevance Distribution in Dependence of Project Manager's Experience

This section examines project health based on the optimized distribution of focus of experienced versus inexperienced project managers during the project execution phase. The following regression parameters have been developed:

Regression function for “Experienced”:

- Second-degree degree polynomial function with twenty-two terms in seven predictors
- Unsatisfying p-values in the process x3 with a value of 0.169
- RMSE: 0.14
- R-squared: 0.707
- Adjusted R-Squared: 0.573

Regression functions for the “Inexperienced”:

- Second-degree polynomial function comprising thirteen terms across seven predictors
- Rambling p-values with the highest in the factor x2*x5 with 0.02
- RMSE: 0.0814
- R-squared: 0.917
- Adjusted R-Squared 0.843

Table 2. Optimized distribution values for different self-evaluations

	“Experienced”	“Inexperienced”
Process P1	9%	29%
Process P2	4%	22%
Process P3	20%	22%
Process P4	0%	0%
Process P5	4%	21%
Process P6	22%	5%
Process P7	19%	0%
Process P8	21%	1%

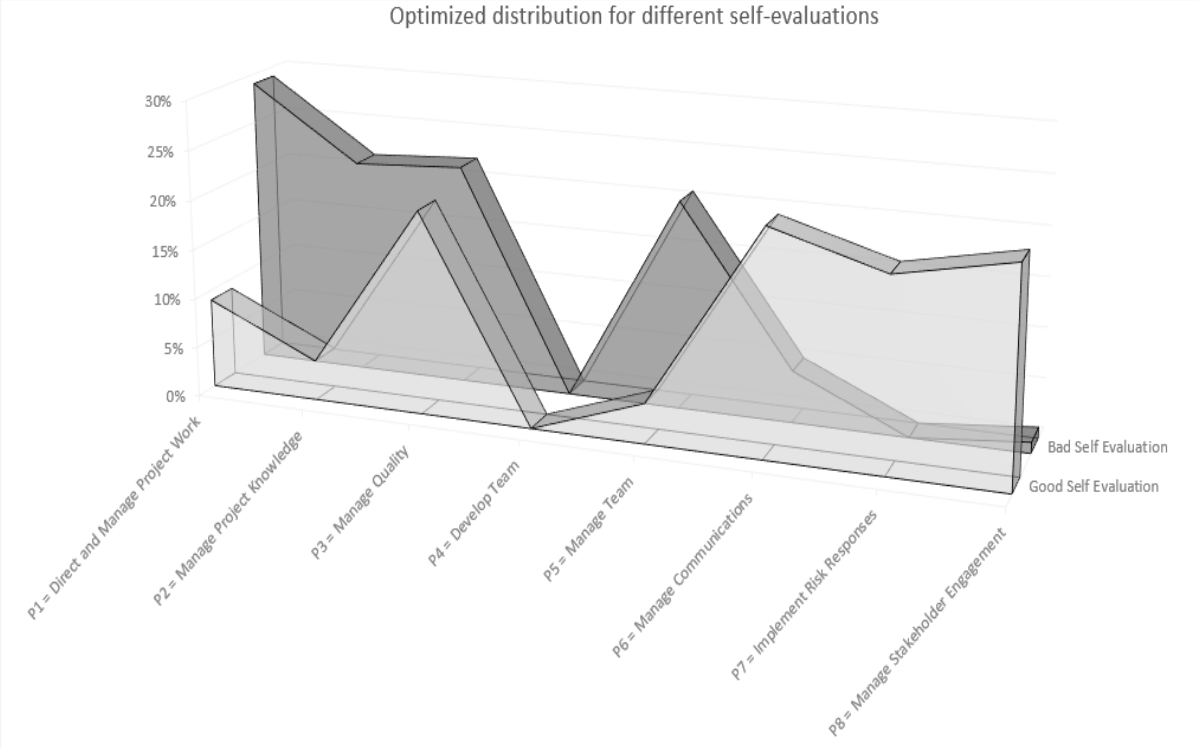

Figure 2. Optimized distribution for different self-evaluations

Limitation

The analysis of the regression parameters showed that, mostly as a result of insufficient data, the p-values are not ideal. Consequently, the results have to act just as an initial idea for a reliable optimization outcome.

Conclusion

After optimizing, the distributions differ for all processes except “Manage Quality” and “Develop Team”. The reason for these substantial changes is that the data collected for optimization, which indicates the current health of the project, has a strong influence on the results. The optimization result indicates that project managers who rated their project skills as inexperienced should focus strongly on the project process "Direct and Manage Project Work", "Manage Project Knowledge", "Manage Quality" as well as "Manage Team". Experienced project managers should focus on the processes "Manage Quality", "Manage Communication", "Implement Risk Responses" and "Manage Stakeholder Engagement".

The purpose of this research was to investigate how project managers perform the project execution phase based on their self-assessed level of experience. It also aimed to highlight an optimized way of performing project management tasks to maximize project health and success. Based on an extensive online survey, the distribution of project process relevance of 103 survey participants was analyzed. The results show that the two groups of "Experienced" and "Inexperienced" participants have almost identical distributions of project process relevance. Thus, the behavior of the project managers is comparable. This correlation changes when these distributions are optimized. According to the results of non-parametric multiple regression, the two groups need to focus on different project processes to ensure maximum project success and health. While inexperienced project managers should focus on directing and managing project work and project knowledge, experienced project managers have to manage quality, communication, risk response, and stakeholder engagement.

Interpreting the optimized results, it can be concluded that experienced project managers do not need to focus extensively on the work packages themselves, but rather on creating a stable and robust working environment to be successful. More of an enabler than a micromanager. In contrast, the optimized results propose that inexperienced project managers should focus on the details and control the essential project work to be successful. However, these interpretations must always be considered with the limitation of unsatisfactory p-values of some regression polynomial factors.

Scientific Ethics Declaration

The authors affirm that this article published in EPSTEM entails scientific, ethical, and legal responsibility. The journal belongs to the authors.

Acknowledgements or Notes

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References

Ashmore, S., & Runyan, K. (2015). *Introduction to agile methods*. Upper Saddle River, NJ: Pearson Education.

Atkinson, R. (1999). Project management: Cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria. *International Journal of Project Management*, *17*(6), 337–342.

Axelos. (2017). *Managing successful projects with PRINCE2®* (2017th ed.). London: TSO.

Bognár, F. (2021). *A novel risk assessment methodology – a case study of the PRISM methodology in a compliance management sensitive sector* (pp.89-108). Acta Polytechnica Hungarica.

Del Castillo, E., & Montgomery, D. C. (1993). A nonlinear programming solution to the dual response problem. *Journal of Quality Technology*, *25*(3), 199–204.

Dittmann, K. (2021). *Projektmanagement (IPMA®): Lehrbuch für level d und basiszertifikat* (GPM) (1st ed.). Freiburg: Haufe Group.

Gyorgy, K. (2006). Research of competitiveness factors of SME. *Acta Polytechnica Hungarica*, *2006*(3), 71–84.
Heroku. (2023, January 17). *Cloud application platform*. Retrieved from https://www.heroku.com/
Khuri, A. I., & Conlon, M. (1981). Simultaneous optimization of multiple responses represented by polynomial regression functions. *Technometrics*, *23*(4), 363–375.
Matos, S., & Lopes, E. (2013). Prince2 or PMBOK – A question of choice. *Procedia Technology*, 787–794.
Project Engineer. (2021, October 18). *The PMBOK's five project phases*. Retrieved from https://www.projectengineer.net/the-pmboks-five-project-phases/.
Project Management Institute. (2017). *A guide to the project management body of knowledge*. Retrieved from https://pmiglobalsummit.gcs-web.com/
Rosenberger, P. (2022). *Optimized tailoring of agile project management frameworks - from combining scrum and PMI towards multivariate optimization for project process relevance factors*. (Doctoral dissertation, Obuda University).
Takács, M. (2010). Multilevel fuzzy approach to the risk and disaster management. *Acta Polytechnica Hungarica*, *7*(4), 91–102.
Tolbert, M., & Parente, S. (2020). *A hybrid project management: Using agile with traditional PM methodologies to succeed on modern projects*. LCC: USABusiness Expert Press.
Varga, J., & Csiszárik-Kocsir, A. (2019). Redefining the role of project leader for achieving a better project result. *PM World Journal*, *8*(8),1–18.
Van Wyngaard, C. J., Pretorius, H. C., & Pretorius, L. (2011). Strategic management of the triple constraint trade-off dynamics - a polarity management approach. In *IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)* (pp. 824–828). Piscataway, NJ: IEEE.

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