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OVERVIEW OF THE IMPACT OF PROJECT PORTFOLIO MANAGEMENT ON FIRMS PERFORMANCE

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ABSTRACT

The objective of this paper is to explore and analyze previous research about the relationship between project portfolio management success and business performance. In order to analyze this relationship, a systematic literature review was performed on scientific databases related to the area of management using inclusion and exclusion criteria defined according to the objective of this literature review. The study found 940 articles and after a comprehensive review 66 were selected. From these articles, we can observe that the relationship of portfolio management and firm performance, although several researchers from different perspectives have covered it, still presents many fields of research. Most of the previous research is based on case studies in medium-sized enterprises stating the need for quantitative research that allows to generalize results and also research of the impact of project portfolio management in SMEs.

Keywords: Project Portfolio Management, Business Performance, Strategy Implementation

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1. INTRODUCTION

Projects are an essential part of the business in general and play a central role in the development, strategic vision, and maintenance of an organization's competitiveness [1], [2]. In this sense, in recent years the use of the term “Project Business” has been defined as the part of the business that is directly or indirectly related to the projects and its purpose is achieving the objectives of one or more organizations[3]. One of the dimensions of the project business focuses on the management of a project-based organization. It is in this context that in addition to the application of good management practices for individual projects, is required the use of portfolio management techniques and tools.

Project portfolio management (PPM) as a method for implementing the strategy is a topic addressed in multiple articles. This article aims to present an analysis of the existing literature on the use and implementation of project portfolio management and its impact on the performance of engineering organizations.

The following article includes the description of the method used for the review, the analysis of the available information and identifies possible lines of research in the area.

2. REVIEW METHOD

For the review of the literature, a systematic review was performed. A systematic review is a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review [4]. A systematic literature review is a form of secondary study since it uses primary studies and employs the following phases [5].

- Planning: includes the definition of the research questions and the review protocol.
- Execution of the review: includes obtaining the articles from the selected scientific databases, selection of articles, quality evaluation of the articles, data extraction, and synthesis.
- Report of results: in this phase, the present document was elaborated with the analysis of the selected articles.

3. REVIEW PROTOCOL

The review protocol describes the rationale, hypothesis, and planned methods of the review. It must be prepared before a review is started and used as a guide to carry out the review [4], [5]

3.1. Research questions

The research questions that guide this work are:

1. How to evaluate project portfolio management success?
2. What variables influences project portfolio management success?
3. How project portfolio management success affects organization performance?

3.2. Data Sources

For the search of the articles, it was decided to use five scientific databases associated with management. Databases selected were Scopus, ISI Web of Science, Science Direct, Proquest and JStor.

3.3. Search string

The search string used for the search in the selected databases was:

(" project portfolio" AND (" business strategy" OR "business objectives" OR "strategy implementation" OR "firm performance"))

3.4. Inclusion Criteria

The inclusion criteria defined for the systematic review were:

1. Only articles published in scientific journals or congresses with indexed annals that have been evaluated by peers will be included.

2. Only articles written in English will be included.

3. It will include articles that relate to the management of the project portfolio with the strategic objectives of the organization.

3.5. Exclusion Criteria

The exclusion criteria defined for the systematic review were:

1. Articles focusing on the management of individual projects will not be included.
2. Articles that focus only on the use of software tools for portfolio management will not be included.
3. Articles that focus only on project selection methods will not be included

4. RESULTS OF THE REVIEW

Based on the search strings in the selected databases, the following results were obtained and are shown following the reco nm006Ammendations of [4] Papers were obtained from databases selected, then duplicate papers were removed. With this list of papers, a double selection process was performed first reviewing title and abstract. Finally, a full text review allows to identify the most relevant papers for this study.

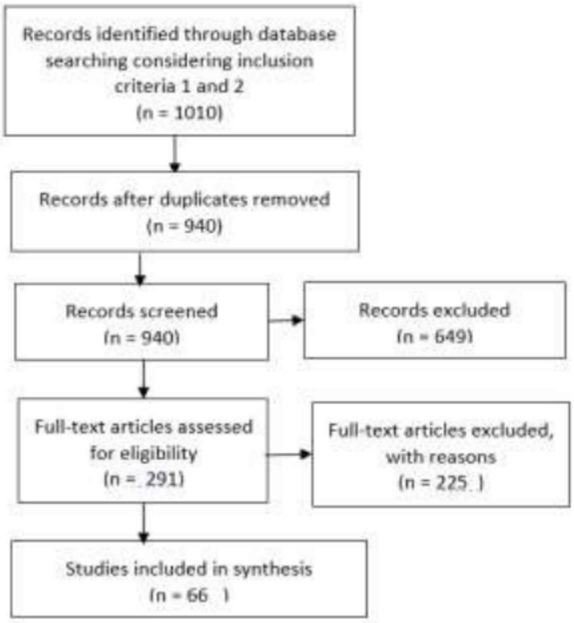

Figure 1 Search Results

The results of the review are presented below grouped into sections that seek to help answer the research questions. It seems also relevant to mention that most of the articles founded focused on the areas of information technology and construction

A bibliometric analysis can be found in [6]

5. EVALUATION OF PORTFOLIO MANAGEMENT SUCCESS

Taking into account that the function of portfolio management is to support the implementation of the organization's strategy, it is crucial to understand how an organization's success is measured. In this context most organizations use only financial metrics to measure success; however several studies have shown that these metrics alone are insufficient as indicators of long-term success, leading to the development of multidimensional success measurement models [7]. In the same line, the evaluation of the success of the portfolio of projects should be made taking into account a multidimensional model. Also, success in portfolio management should be defined taking into account the achievement of goals from different perspectives of stakeholders [8].

The success of a project can be measured based on several factors, including economic success and preparation for the future [7]. More specifically, the following factors can be identified to evaluate the coordinated management of multiple projects: resource productivity, organizational learning, Time- to – market, customer satisfaction and growth and personal satisfaction [9]

In other studies, Patanakul [8] citing Cooper's work suggests that the performance of the portfolio can be measured from an appropriate number of projects in the portfolio for available resources, carry out the projects within the established deadline and efficiently in time and have a portfolio of high-value projects that is balanced, aligned with the business strategy and whose decomposition of expenses reflects the business strategy and strategic priorities.

The above leads to a model of efficiency attributes of portfolio management based on strategic and operational attributes [8]. Strategic attributes include strategic alignment with the strategic direction of the organization, adaptability to internal and external changes, facing risks and uncertainties and consider projects with a high expected value. Operational attributes include the degree of project exposure to interested parties, transparency in decision making and predictability of project delivery.

Likewise, some articles consider that the evaluation of the success of the project portfolio must include sustainability as a critical aspect [10]–[13]. It is also worth mentioning that in order to evaluate the success of the portfolio, it is necessary to have reliable and structured data, which are not always available [14]

Developing project management skills is a prerequisite for effective portfolio management. [15]. It also establishes that flexibility is an essential feature in order to cope with changing environments and conditions [16].

Jerbrant [17] presents a model that helps to understand the different maturation stages for project-based organizations. Bergman & Gunnarson [15] present a similar model. It's important to state that applying these models, in project-based organizations, often implies structural changes [18], [19].

From the above, the development of portfolio management capabilities involves a process of maturation that begins with the management of individual projects. In this way, project management would be a previous step before being able to implement portfolio management and the literature offers a set of indicators that can be used to evaluate the effectiveness of a portfolio of projects, which include strategic and operational aspects. The latter is more related to the management of specific projects.

6. CHALLENGES AND PROBLEMS OF PORTFOLIO MANAGEMENT

Portfolio management, like any other organizational process, faces challenges and problems, summarized below.

The interdependencies that arise between different projects, as well as between projects and their environment are significantly difficult [17], [20]–[23]. In an organization, there may, exist several types of portfolios (portfolio of ideas, portfolios of resources, portfolio of assets) with which a strong interaction is required [24]. Likewise, each strategic area can manage its portfolio, but this portfolio must be aligned with the organization's portfolio [25]. In this same line, one of the main reasons why a portfolio may fail is because it has too many projects and few resources [26]

Projects for the development of new products present the most significant challenges, a topic widely covered in the literature [27]–[30]. In these types of projects, the highly uncertain nature of resource allocation decisions makes searching for a balanced portfolio an even more complicated task [27]. Particularly when dealing with radical innovations it is necessary to consider the evaluation of the projects in relation to the selection of technologies, market to be developed, size of the potential market, costs of seeking innovation, operating costs, political environment, taxes, profitability, structure organizational, economic environment and competition [31], which implies decisions at various levels of the organization.

Risk management is another factor that affects the management of portfolios. Multiple authors [32]–[41] cover this topic, and the current edition of the Project Portfolio Management Standard from the Project Management Institute include it [42].

In general, portfolio risks can be grouped into strategic risks, exposure to technology, organizational change, management, communications, legal, project organization, project management and project complexity [37]. More recently, [43] states that project portfolio risk sources can be classified as ‘systematic’ and ‘non-systematic’, and that four operational risk portfolio categories should be considered in order to characterize and ultimately assess project portfolio risk: ‘portfolio management level’, ‘environmental conditions’, ‘project interactions’, and ‘internal processes’.

Although portfolio management processes include periodic review, there is the assumption that no significant changes to the portfolio will occur until the next periodic review (which may be quarterly, semiannually or annually) and that individual projects dealt with risks and uncertainties in the course of its execution [44]. An uncertainty management perspective in the context of portfolio management draws attention to the need to understand and manage the variability in the organization's activities that have impacts on a series of projects [45]. This perspective highlights the need to put in place approaches and techniques to address some aspects of uncertainty in projects outside the context of individual projects. It may include technical uncertainty, market uncertainty, organizational uncertainty and financial uncertainty [44].

The desire to avoid the inefficiency and urgency of managing uncertainty and risks increases the degree of control and bureaucratization, which often reduces creativity and flexibility [17], [20]. This uncertainty arises due to the complexity of the tasks in combination with the complexity of the organization [20]. It also generates an additional problem for organizations that do not use traditional methods such as agile methods [46], [47]

On the other hand, making organizational decisions, such as project selection and allocation of resources is an inherently political issue in nature, and therefore cannot be adequately managed without taking into account this dimension of the process [27], [48], [49]. Even more, Nyandongo and Mshweshwe [50] states that one of the main challenges that hamper project portfolio success is that sufficient resources are not in place to achieve project portfolio objectives. Associate with this topic, also the decision to terminate or not in advance a project influences the success of the portfolio [50]–[52].

Finally, the inclusion of portfolio management in an organization can include challenges such as alignment with existing processes and commitment of the participants [46]. Also, strategic alignment, control, and communication, [53] as well as learning and knowledge management, represent challenges for the implementation of portfolio management [53]–[55].

In summary, the successful application of portfolio management practices faces multiple challenges. These include the definition of the adequate number of projects based on available resources, the risk management and uncertainty of the portfolio, the definition of the processes and the management of the involved ones including topics of communication, training, as well as political subjects that affect the decisions on the allocation of resources.

7. SUCCESS FACTORS OF PORTFOLIO MANAGEMENT

Based on the review of the articles, several factors affect the success of portfolio management and its consequent impact on the achievement of the strategic objectives.

Concerning the alignment of the portfolio with the strategic objectives, some internal and external factors affect the alignment. Internal factors include communication, executive support, involvement of project managers in the development of the strategy, leadership competencies of the project manager, project team competencies, project resources, and project management tools [56], [57], likewise the involvement of line managers and senior managers affect the success of the portfolio management [29], [57], [58]. Associated with the above, [59] suggests that the empowerment of portfolio managers positively influences results and [60] suggests that transformational leadership can influence project portfolio success under mediating conditions of strategic innovation orientation and moderating role of portfolio governance.

It also seems relevant that the level of involvement of each one of the interested parties may vary according to the stage in the process in which they find themselves. For example, Beringer, Jonas, & Gemunden [61] states that senior management dominates the structuring of the portfolio, middle management control the allocation of resources, and the portfolio manager tends to dominate the direction of the portfolio. The above, in turn, suggests the need for clear roles and responsibilities in the governance of organizational project management [62].

The studies of Lerch and Spieth [63], [64] also state that the perception and satisfaction of senior management has a positive or negative impact on the success of the portfolio.

External factors include the dynamic market, suppliers and contractors, and government agencies [56]. Likewise, some studies suggest that national and corporate culture has an impact on the success of portfolio management [28], [65], [66].

It is worth mentioning that before selecting the portfolio projects, it is necessary to generate the ideas or proposals. The above corresponds to the Frontend phase. Related studies suggest that the success of this phase is related to the success of the project portfolio [67]–[69]. They also mention that this effect is stronger in companies with larger portfolios, portfolios with greater interdependence between projects and in companies with a high-risk orientation [67].

The process of control is another critical aspect of the success of the portfolio. In this aspect, it is necessary to monitor the deviations reported in the milestones and the positive and negative economic risks, as well as to identify the financial flexibility of the portfolio for the execution of payments [70].

In general, decision making at the portfolio level requires coordinating the involvement of all participants and that this task is more important than the development of sophisticated methods [27]. In this same line [71] highlights the importance of managing customer relationships so that the portfolio generates the highest value. It also implies the participation of the marketing area (responsible for contact with customers). In a later study [72] confirms that the value of the relationship with the client (from and to) positively affects the success of the portfolio and adds that the economic turbulence positively moderates this effect.

In two reviewed articles [18], [73] it is analyzed that a successful structural change impacts the successful implementation of PPM in an organization. In particular [18] emphasizes the importance of an adequate centralization of information processes, which allows having higher quality information at the right time for decision making. The above can lead, among other things, to the creation of a PMO (Project Management Office) and PPMO (Project Portfolio Management Office) that can exercise coordination, control and support functions [74]. About this topic Ichsan and Sadeli [75] states that PMO practices (PMOP) have a direct effect on PPM, but the presence of a formal PMO does not necessarily indicate that PMOP are applied more effectively within the organization.

In [20], and [14], it is established that the work of managing multiple projects requires a balance between flexibility and structure. In this context, improvisation is understood as the possibility of creating a space for action, moving away from time pressured, rigid and rational formal structures. In this sense, the success of portfolio management does not depend on an entirely rational process, but also negotiation and bargaining [73].

Finally, the observation of portfolio management meetings [76] identifies some additional factors that may influence the success of portfolio management. These include understanding that rules can be negotiated and that decision makers are more likely to fulfill identities when they see themselves as effective, keep in mind that people obtain social approval in the organization by meeting the expectations of other, take into account that the organizational context and its history influence decisions and learn from past experiences.

Although it is not the only factor associated with the success of the project, the use of an adequate information system helps to support the portfolio management process [56].

From the above, the management of the portfolio can only generate positive results as long as other internal and external factors accompany it. Given that the organization has no control over external factors, work must be done on internal factors, which in turn can be grouped into human factors (organizational culture, communication, stakeholder involvement, relationship with the client, and related factors), organizational structure and processes, particularly the process control which in turn is enhanced by the use of an information system project. The absence of these factors may instead become an obstacle.

8. IMPACT OF PORTFOLIO MANAGEMENT ON ORGANIZATION PERFORMANCE

Among the articles reviewed, it is common to find references to management theories like Resource-Based View (RBV), Dynamic Capabilities, and Organizational Theory.

One of the most mentioned is the theory of dynamic capabilities. From this perspective, we seek to understand how portfolio management can be considered a dynamic capability and how the use of this perspective, together with RBV helps to understand how portfolio management can contribute to generating a competitive advantage for the organization [17], [19], [44], [54], [77]–[80]. Understanding capability as a specific type of resource that allows the organization to deploy other resources to perform activities that generate the expected results, the portfolio management capability can be defined as a combination of organizational structure, specific processes and the people involved in the management of portfolio [19]. Organizational routines, such as portfolio management processes, constitute a dynamic capability due to the role they play in the ability of the organization to continuously align projects to deliberate and emerging organizational strategy [19], [81].

In this context, [54] states that portfolio management capabilities of innovation projects help to improve the success rate of innovation projects of products and services by providing a holistic and sensitive environment for decision making in order to maximize the value to long term investment in innovation Likewise, corporate learning and improvement processes involved in portfolio management are highlighted [44]. The results of an investment in effective learning will be a portfolio of projects aligned, balanced, with high value and with adequate resources that will provide the greatest return on investment in learning and investment in projects [19]. In other words, the ability to structure the project portfolio is a dynamic capability that when aligned with strategic orientation leads to better portfolio results [7].

From the previous articles, portfolio management has a strategic value for the organization by guaranteeing the alignment of the projects with the objectives, which in turn can generate a competitive advantage. In this context several articles suggest the importance of portfolio management for the implementation of the organization's strategy. However, only some of the reviewed articles use quantitative methods to analyze the impact.

Within this group, the article [82] evaluates the impact of project management capacities on organizational performance and within the most relevant findings included in this study are:

- Business capabilities describe 38% of the revenue variance, while project management skills describe 14% and portfolio management skills 13%.
- Concerning staff turnover, business skills describe 58% of the variance, project management skills 26% and capacities in Portfolio Management 15%.
- Concerning the performance of the projects, specifically in the variation of schedules, the business capacities describe 33% of the variance, the capacities in project management 22% and the capacities in Portfolio Management only 5%.
- Concerning the scope of the projects, the business capacities describe 28% of the variance, the capacities in project management 27% and the capacities in Portfolio Management 10%.
- Finally, concerning the cost of the projects, the business capacities describe 23% of the variance, the capacities in project management 15% and the capacities in Portfolio Management 12%.

From the above, for the organizations included in the study, both project management and portfolio management influence financial and project results but the most influential variable is business capacities. According to results, the three primary project capacities that influence financial results are time, scope and cost management, maximization of project portfolio and logistics management [82].

The studies [63] and [83] made a quantitative study whose results suggest that the ability of portfolio management improves organizational performance by allowing higher levels of innovation and technological aspects.

Specifically speaking of innovation projects, considered of increasing importance in a competitive global world where the survival of the organization depends strongly on the development of new products [28], adequate portfolio management can generate the following benefits: [11]

- Focus only on those innovations and knowledge that help create value from sustainability.
- Respond with agility to the changing needs of the clients.
- Improve the performance of the organization through the effective translation of the innovation strategy to execution.
- Improve the performance of portfolio management of innovation projects based on a gradual forecasting approach.
- It helps to adapt the portfolio of innovation projects continuously.
- Proposals for previously rejected innovation projects can be reconsidered when a positive business case is developed based on new data of technological advances or market trends.

On the other hand, we can find articles in the literature that challenge these claims. In particular [84], presents a study conducted in Australia, considered as an example of public management, where they apply good management practices for project selection and management. The results show no improvement in the achievement of the strategic objectives, so the authors conclude that this case presents a systemic weakness in the way they select and govern projects.

In summary, although some studies suggest that the implementation of portfolio management has an impact on the results or performance of the organization, the number of studies suggesting this is limited, leaving room for research in this field. Also, it´s essential to note that according to [82], business capacities must also be present in order to affect the organization results positively.

9. CONCLUSION

From the review of the literature, we can observe that the issue of portfolio management, although several researchers from different perspectives have covered it, still presents many fields of research.

Regarding the research methods used in the articles, the vast majority use case studies as a basis for research, making it difficult to generalize the results.

Finally, portfolio management is not an isolated function within the organization but interacts with multiple areas, which makes that the participation of the rest of the actors involved influences the success of the portfolio management.

Relative to the size of the companies considered in the studies show that most cover medium-sized enterprises (considering a medium-sized, one with fewer than 500 employees) and large (over 500 employees). Only four studies mentioned small companies [82], [85]–[87]. It is noted that the level of separation of functions of general management with project management clearly depends on the size of the organization [88] and that although the formalization of project management and portfolio management processes can positively influence the results [63], the level of formalization required depends on the complexity of the projects [89] and the interdependence between them [66]. In this way, the practices that apply in a large organization do not necessarily apply in a small or medium business. According to this, it is necessary to identify if portfolio management could have an impact on the performance of small and medium enterprises.

REFERENCES

[1] K. A. Artto and K. Wikström, “What is project business?,” Int. J. Proj. Manag., vol. 23, no. 5, pp. 343–353, Jul. 2005.

[2] K. Wikström, K. Artto, J. Kujala, and J. Söderlund, “Business models in project business,” Int. J. Proj. Manag., vol. 28, no. 8, pp. 832–841, Dec. 2010.

[3] K. Artto and J. Kujala, “Project business as a research field,” Int. J. Manag. Proj. Bus., vol. 1, no. 4, pp. 469–497, 2008.

[4] D. Moher, A. Liberati, J. Tetzlaff, and D. G. Altman, “Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement,” Ann. Intern. Med., vol. 151, no. 4, pp. 264–269, 2009.

[5] B. Kitchenham, “Procedures for performing systematic reviews,” Keele, UK, Keele Univ., vol. 33, no. TR/SE-0401, p. 28, 2004.

[6] L. Flores, “Overview of the Impact of Project Portfolio Management on Performance of Engineering Firms - Bibliometric Analysys,” 2020. [Online]. Available: https://drive.google.com/file/d/1zbAsblh5qp0g9OuhniT6UDb77HegqLQs/view?usp=sharing.

[7] S. Meskendahl, “The influence of business strategy on project portfolio management and its success — A conceptual framework,” JPMA, vol. 28, pp. 807–817, 2010.

[8] P. Patanakul, “Key attributes of effectiveness in managing project portfolio,” Int. J. Proj. Manag., vol. 33, no. 5, pp. 1084–1097, Jul. 2015.

[9] P. Patanakul and D. Milosevic, “The effectiveness in managing a group of multiple projects: Factors of influence and measurement criteria,” Int. J. Proj. Manag., vol. 27, no. 3, pp. 216–233, Apr. 2009.

[10] K. Khalili-Damghani and M. Tavana, "A comprehensive framework for sustainable project portfolio selection based on structural equation modeling," Proj. Manag. J., vol. 45, no. 2, pp. 83–97, 2014.

[11] J. W. Brook and F. Pagnanelli, "Integrating sustainability into innovation project portfolio management – A strategic perspective," J. Eng. Technol. Manag., vol. 34, pp. 46–62, Oct. 2014.

[12] B. Ngqulunga and D. Walwyn, "Efficient project portfolio management: Avoiding value destruction by promoting social returns on RD," in PICMET 2018 - Portland International Conference on Management of Engineering and Technology: Managing Technological Entrepreneurship: The Engine for Economic Growth, Proceedings, 2018.

[13] D. Hoffmann, T. Müller, and F. Ahlemann, "Balancing alignment adaptivity and effectiveness - design princples for for sustainable IT project management," Ecis, vol. Spring, pp. 1503–1520, 2017.

[14] P. Bruno De Souza, J. Carneiro, Ω Puc-Rio, and R. Bandeira-De-Mello, "Inquiry into the Conceptual Dimensions of Project Portfolio Management," BBR Spec. Issues Vitória-ES, pp. 118–148, 2015.

[15] C. R. Inger Bergman, Sven Gunnarson, "Decoupling and standardization in the projectification of a company," Int. J. Manag. Proj. Bus., vol. 6, no. 1, pp. 106–128, 2013.

[16] E. Gutiérrez and M. Magnusson, "Dealing with legitimacy: A key challenge for Project Portfolio Management decision makers," Int. J. Proj. Manag., vol. 32, no. 1, pp. 30–39, Jan. 2014.

[17] A. Jerbrant, "A MATURATION MODEL FOR PROJECT-BASED ORGANISATIONS – WITH UNCERTAINTY MANAGEMENT AS AN EVER-PRESENT MULTI-PROJECT MANAGEMENT FOCUS," SAJEMS Spec. Issue, vol. 17, pp. 33–51, 2014.

[18] M. G. Kaiser, F. El Arbi, and F. Ahlemann, "Successful project portfolio management beyond project selection techniques: Understanding the role of structural alignment," Int. J. Proj. Manag., vol. 33, no. 1, pp. 126–139, Jan. 2015.

[19] C. P. Killen, R. a. Hunt, and E. J. Kleinschmidt, "Learning investments and organizational capabilities: Case studies on the development of project portfolio management capabilities," Int. J. Manag. Proj. Bus., vol. 1, no. 3, pp. 334–351, 2008.

[20] A. Jerbrant and T. K. Gustavsson, "Managing project portfolios: balancing flexibility and structure by improvising," Int. J. Manag. Proj. Bus., vol. 6, no. 2, pp. 365–378, 2013.

[21] M. Thiry and M. Deguire, "Recent developments in project-based organisations," Int. J. Proj. Manag., vol. 25, no. 7, pp. 649–658, Oct. 2007.

[22] S. Bathallath, Å. Smedberg, and H. Kjellin, "The viable system model for diagnosing and handling IT-project interdependencies in large portfolios," Int. J. Inf. Technol. Proj. Manag., vol. 10, no. 1, pp. 72–87, 2019.

[23] S. Bathallath, Å. Smedberg, and H. Kjellin, "Project Interdependency Management in IT/IS Project Portfolios: From a Systems Perspective," Procedia Comput. Sci., vol. 100, pp. 928–934, 2016.

[24] M. Young, J. Owen, and J. Connor, "Whole of enterprise portfolio management," Int. J. Manag. Proj. Bus., vol. 4, no. 3, pp. 412–435, 2011.

[25] I. V. Ilyin and A. B. Teslya, "Strategic business areas as a mechanism for coordinating stakeholder interests when managing a company's project portfolio," St. Petersbg. State Polytech. Univ. Journal. Econ., vol. 240, no. 2, pp. 60–68, 2016.

[26] A. J. Buys and M. J. Stander, "Linking projects to business strategy through project portfolio management," South African J. Ind. Eng., vol. 21, no. 1, pp. 59–68, 2010.

[27] M. a. Weissenberger-Eibl Teufel, "Organizational politics in new product development project selection: A review of the current literature," Eur. J. Innov. Manag., vol. 14, no. 1, pp. 51–73, 2011.

[28] C. P. Killen, R. a. Hunt, E. J. Kleinschmidt, and R. a. Hunt, "Project portfolio management for product innovation," Int. J. Qual. Reliab. Manag., vol. 25, no. 1, pp. 24–38, 2008.

[29] C. Beringer, D. Jonas, and A. Kock, "Behavior of internal stakeholders in project portfolio management and its impact on success," Int. J. Proj. Manag., vol. 31, no. 6, pp. 830–846, Aug. 2013.

[30] R. G. Cooper, S. J. Edgett, and E. J. Kleinschmidt, "Benchmarking Best NPD Practices-II," 2016.

[31] A. S. Paulson, G. C. O. Connor, and D. Robeson, "EVALUATING RADICAL Large firms that successfully radical innovations," no. c, pp. 17–29, 2000.
[32] H. Sanchez, B. Robert, and R. Pellerin, "A Project Portfolio Risk-Opportunity Identification Framework ," Proj. Manag. J., vol. 39, no. 3, pp. 97–109, 2008.
[33] H. Sanchez, B. Robert, M. Bourgault, and R. Pellerin, "Risk management applied to projects, programs, and portfolios," Int. J. Manag. Proj. Bus., vol. 2, no. 1, pp. 14–35, 2009.
[34] H. R. Costa, M. de O. Barros, and G. H. Travassos, "Evaluating software project portfolio risks," J. Syst. Softw., vol. 80, no. 1, pp. 16–31, Jan. 2007.
[35] J. R. Drake and T. A. Byrd, "Risk in Information Technology Project Portfolio Management," J. Inf. Technol. Theory Appl., vol. 8, no. 3, pp. 1–11, 2006.
[36] J. Teller and A. Kock, "An empirical investigation on how portfolio risk management influences project portfolio success," Int. J. Proj. Manag., vol. 31, no. 6, pp. 817–829, Aug. 2013.
[37] M. J. Sheykh, M. Azizi, and M. H. Sobhiyah, "How can the Trade off between Corporate Business Strategy and Project Risk be Optimized?," Procedia - Soc. Behav. Sci., vol. 74, pp. 134–143, Mar. 2013.
[38] F. Ghasemi, M. H. M. Sari, V. Yousefi, R. Falsafi, and J. Tamošaitiene, "Project portfolio risk identification and analysis, considering project risk interactions and using Bayesian Networks," Sustain., vol. 10, no. 5, 2018.
[39] B.-J. Tang, H.-L. Zhou, and H. Cao, "Selection of overseas oil and gas projects under low oil price," J. Pet. Sci. Eng., vol. 156, pp. 160–166, 2017.
[40] J. Teller, "Portfolio risk management and its contribution to project portfolio success: An investigation of organization, process, and culture," Proj. Manag. J., vol. 44, no. 2, pp. 36–51, 2013.
[41] J. Teller, A. Kock, and H. G. Gemünden, "Risk management in project portfolios is more than managing project risks: A contingency perspective on risk management," Proj. Manag. J., vol. 45, no. 4, pp. 67–80, 2014.
[42] Project Management Institute, "Standard For Portfolio Management Third Edition." Project Management Institute, 2013.
[43] C. Micán, G. Fernandes, M. Araújo, and E. Ares, "Operational risk categorization in project-based organizations: A theoretical perspective from a project portfolio risk lens," Procedia Manuf., vol. 41, pp. 771–778, 2019.
[44] Y. Petit, "Project portfolios in dynamic environments: Organizing for uncertainty," JPMA, vol. 30, pp. 539–553, 2012.
[45] K. Pedersen and J. A. Nielsen, "Managing Uncertainty And Conflict In It Project Portfolio Management," J. Inf. Technol. Case Appl. Res., vol. 13, no. 4, pp. 51–83, 2011.
[46] C. J. Stettina and J. Hörz, "Agile portfolio management: An empirical perspective on the practice in use," Int. J. Proj. Manag., vol. 33, no. 1, pp. 140–152, Jan. 2015.
[47] R. Sweetman and K. Conboy, "Portfolios of Agile Projects: A Complex Adaptive Systems' Agent Perspective," Proj. Manag. J., vol. 49, no. 6, pp. 18–38, 2018.
[48] N. Hadjinicolaou and J. Dumrak, "Investigating Association of Benefits and Barriers in Project Portfolio Management to Project Success," in Procedia Engineering, 2017, vol. 182, pp. 274–281.
[49] K. Pedersen, "It project selection: Politics, experience and good friends," Electron. J. Inf. Syst. Eval., vol. 19, no. 1, pp. 55–70, 2016.
[50] K. M. NYANDONGO and A. MSHWESHWE, "INFORMATION TECHNOLOGY (IT) PROJECT PORTFOLIO MANAGEMENT PRACTICES IN SOUTH AFRICA," in 26th International Association for Management of Technology Conference; IAMOT 2017, 2020, pp. 1–15.
[51] Y. Li and T. Chi, "Venture capitalists' decision to withdraw: The role of portfolio configuration from a real options lens," Strateg. Manag. J., vol. 34, no. 11, pp. 1351–1366, 2013.
[52] B. N. Unger, A. Kock, H. G. Gemünden, and D. Jonas, "Enforcing strategic fit of project portfolios by project termination: An empirical study on senior management involvement," JPMA, vol. 30, pp. 675–685, 2012.
[53] L. Dooley, G. Lupton, and D. O'Sullivan, "Multiple project management: a modern competitive necessity," J. Manuf. Technol. Manag., vol. 16, no. 5, pp. 466–482, 2005.

[54] C. P. Killen and R. A. Hunt, “Dynamic capability through project portfolio management in service and manufacturing industries,” Int. J. Manag. Proj. Business2, vol. 3, no. 1, pp. 157–169, 2010.

[55] U. Rosselet, Y. Jolliet, and M. Wentland, “Knowledge management for IT project portfolio,” in Proceedings of the European Conference on Knowledge Management, ECKM, 2009, vol. 2, pp. 695–700.

[56] T. Alsudiri, W. Al-Karaghouli, and T. Eldabi, “Alignment of large project management process to business strategy A review and conceptual framework,” 2013.

[57] Y. Yang and D.-L. Xu, “A methodology for assessing the effect of portfolio management on NPD performance based on Bayesian network scenarios,” Expert Syst., vol. 34, no. 2, 2017.

[58] V. Hermano and N. Martín-Cruz, “The role of top management involvement in firms performing projects: A dynamic capabilities approach,” J. Bus. Res., vol. 69, no. 9, pp. 3447–3458, 2016.

[59] D. Jonas, “Empowering project portfolio managers: How management involvement impacts project portfolio management performance,” Int. J. Proj. Manag., vol. 28, no. 8, pp. 818–831, Dec. 2010.

[60] U. Zaman, R. D. Nadeem, and S. Nawaz, “Cross-country evidence on project portfolio success in the Asia-Pacific region: Role of CEO transformational leadership, portfolio governance and strategic innovation orientation,” Cogent Bus. Manag., vol. 7, no. 1, pp. 1–26, 2020.

[61] C. Beringer, D. Jonas, and H. Gemunden, “Establishing Project Portfolio Management - An exploratory Analysis of the influence of internal stakeholders’ interactions,” Proj. Manag. J., vol. 43, no. 6, pp. 16–32, 2017.

[62] I. Hyväri, “Roles of Top Management and Organizational Project Management in the Effective Company Strategy Implementation,” Procedia - Soc. Behav. Sci., vol. 226, no. October 2015, pp. 108–115, 2016.

[63] M. Lerch and P. Spieth, “Innovation project portfolio management: A qualitative analysis,” IEEE Trans. Eng. Manag., vol. 60, no. 1, pp. 18–29, 2013.

[64] P. Spieth and M. Lerch, “Augmenting innovation project portfolio management performance: The mediating effect of management perception and satisfaction,” R D Manag., vol. 44, no. 5, pp. 498–515, 2014.

[65] B. N. Unger, J. Rank, and H. G. Gemünden, “Corporate innovation culture and dimensions of project portfolio success: The moderating role of national culture,” Proj. Manag. J., vol. 45, no. 6, pp. 38–57, 2015.

[66] C. P. Killen and C. Kjaer, “Understanding project interdependencies: The role of visual representation, culture and process,” Int. J. Proj. Manag., vol. 30, no. 5, pp. 554–566, 2012.

[67] A. Kock, W. Heising, and H. G. Gemünden, “A Contingency Approach on the Impact of Front-End Success on Project Portfolio Success,” Proj. Manag. J., vol. 47, no. 2, pp. 115–129, 2016.

[68] A. Kock, W. Heising, and H. G. Gemünden, “How ideation portfolio management influences front-end success,” J. Prod. Innov. Manag., vol. 32, no. 4, pp. 539–555, 2015.

[69] W. Heising, “The integration of ideation and project portfolio management — A key factor for sustainable success,” Int. J. Proj. Manag., vol. 30, no. 5, pp. 582–595, Jul. 2012.

[70] P. Eik-Andresen, A. Johansen, A. D. Landmark, and A. Ø. Sørensen, “Controlling a Multibillion Project Portfolio - Milestones as Key Performance Indicator for Project Portfolio Management,” Procedia - Soc. Behav. Sci., vol. 226, no. October 2015, pp. 294–301, 2016.

[71] M. Voss, “Impact of customer integration on project portfolio management and its success—Developing a conceptual framework,” Int. J. Proj. Manag., vol. 30, no. 5, pp. 567–581, Jul. 2012.

[72] M. Voss and A. Kock, “Impact of relationship value on project portfolio success — Investigating the moderating effects of portfolio characteristics and external turbulence,” Int. J. Proj. Manag., vol. 31, no. 6, pp. 847–861, Aug. 2013.

[73] M. Martinsuo, “Project portfolio management in practice and in context,” JPMA, vol. 31, pp. 794–803, 2013.

[74] B. N. Unger, H. G. Gemünden, and M. Aubry, “The three roles of a project portfolio management office: Their impact on portfolio management execution and success,” Int. J. Proj. Manag., vol. 30, no. 5, pp. 608–620, 2012.

[75] M. Ichsan and J. Sadeli, "Fostering Project Delivery Capabilities in Indonesian Commercial," PERTANIKA J. Soc. Sci. Humanit., vol. 28, no. 2, pp. 827–846, 2020.
[76] J. K. Christiansen and C. Varnes, "From models to practice: decision making at portfolio meetings," Int. J. Qual. Reliab. Manag., vol. 25, no. 1, pp. 87–101, 2008.
[77] E. M. Daniel, J. M. Ward, and A. Franken, "A dynamic capabilities perspective of IS project portfolio management," J. Strateg. Inf. Syst., vol. 23, no. 2, pp. 95–111, Jun. 2014.
[78] H. Sicotte, N. Drouin, and H. Delerue, "Innovation portfolio management as a subset of dynamic capabilities: Measurement and impact on innovative performance," Proj. Manag. J., vol. 45, no. 6, pp. 58–72, 2015.
[79] T. Biedenbach and R. Müller, "Absorptive, innovative and adaptive capabilities and their impact on project and project portfolio performance," Int. J. Proj. Manag., vol. 30, no. 5, pp. 621–635, Jul. 2012.
[80] C. P. Killen, K. Jugdev, N. Drouin, and Y. Petit, "Advancing project and portfolio management research: Applying strategic management theories," JPMA, vol. 30, pp. 525–538, 2012.
[81] H. G. (Kopmann, J., Kock, A., Killen, C. P., & Gemünden, "The role of project portfolio management in fostering both deliberate and emergent strategy," Int. J. Proj. Manag., 2017.
[82] M. Rungi, "The impact of capabilities on performance," Ind. Manag. Data Syst., vol. 114, no. 2, pp. 241–257, 2014.
[83] C. Urhahn and P. Spieth, "Governing the portfolio management process for product innovation - A quantitative analysis on the relationship between portfolio management governance, portfolio innovativeness, and firm performance," IEEE Trans. Eng. Manag., vol. 61, no. 3, pp. 522–533, 2014.
[84] R. Young, M. Young, E. Jordan, and P. O'Connor, "Is strategy being implemented through projects? Contrary evidence from a leader in New Public Management," Int. J. Proj. Manag., vol. 30, no. 8, pp. 887–900, Nov. 2012.
[85] M. Rungi, "Success rate and resource consumption from project interdependencies," Ind. Manag. Data Syst., vol. 110, no. 1, pp. 93–110, 2010.
[86] E. Vacík, M. Špaček, J. Fotr, and L. Kracík, "Project portfolio optimization as a part of strategy implementation process in small and medium-sized enterprises: A methodology of the selection of projects with the aim to balance strategy, risk and performance | Optimalizace projektových portfolií jako," E a M Ekon. a Manag., vol. 21, no. 3, pp. 107–123, 2018.
[87] J. Vähäniitty, K. Rautiainen, and C. Lassenius, "Small software organizations need explicit project portfolio management," IBM J. Res. Dev., vol. 54, no. 2, 2010.
[88] É. Ligetvári Student, "Project Portfolio Management: A Pilot Survey on the Importance of 'Project Building Stones' in Corporate Life," Club Econ. Miskolc' TMP, vol. 9, no. 1, pp. 57–62, 2013.
[89] J. Teller, B. N. Unger, A. Kock, and H. G. Gemünden, "Formalization of project portfolio management: The moderating role of project portfolio complexity," Int. J. Proj. Manag., vol. 30, no. 5, pp. 596–607, 2012.