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Optimal Buffer Sizing in Project Portfolios Under Managerial Overconfidence: Evidence from Global Engineering Firms

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Abstract
The article focuses on exploring the nature of managerial overconfidence impact on the determination of buffers sizes in project portfolio of global engineering firms. The overconfident managers will make the most significant resources that are not necessarily leading to poor resources and risk placement through their managers misplaced confidence which will ultimately affect the project success. The research involves a quantitative study that incorporates the survey of senior managers in multinational engineering firms. The study is concerned with the following two questions: Does managerial overconfidence relate to inefficiency in buffer sizing? What kind of effect does this have on the project portfolio performance? The sample size took 150 senior managers and regression analysis was used to study the correlation between managerial over-confidence and the buffer sizes and robustness checks were done to accommodate such other factors as organization culture and experience. The results indicate that the greater the buffer size, the more managerial overconfidence that existed which in turn yielded worse results in portfolio performance. Managers, who are overconfident, will spread more resources on the buffers that make the project less flexible at the later stages. Even though they think that they are the best at managing risk, their judgment can still result in inefficiencies. This paper shows the behavioral issues affecting project management and that firms should use training programs to reduce overconfidence biases during the decision-making process. A duration of six months was recorded to collect the data and the regression model showed that buffer sizes increased based on managerial overconfidence by 15 percent causing a 10 percent decrease in the performance of the portfolios.

Keywords*: Inappropriate Confidence on the Managers, Portfolio of Projects, Buffer-Based Sizing, Multi-National Engineering Firms, Resource Selection*

Introduction

The success of any global engineering firm depends largely upon its effective project portfolio management (PPM) as the key activity is the ability to address a variety of projects, frequently complex in nature at the same time. In such an environment, it is very essential to manage the risk involved in every project and to make sure that the optimum use of resources is maintained which in turn helps to have a competitive edge and make profits. Buffer sizing is one of the most important decisions in PPM and involves setting aside reserves of supplies that are established to correct the risk of the project such as delays, cost overruns and unexpected complications. The objective of buffers is to cushion the uncertainties involved in the execution of a project and have

something that can ensure that the uncertainty does not occur to derail a project. Nevertheless, the choice of the size of these buffers is not objective, it is based on a combination of factors, including psychological biases, which can misrepresent the decision-making activity.[

One such cognitive bias of a manager is overconfidence, which can greatly influence the decisions that relate to buffer sizing. Overconfidence is a situation where people especially managers exaggerate their power, accurateness of predictions, and optimism of good outcomes. This bias, in case of project portfolio management, may come as a result of underestimating of the risks, overestimating project performance and less allocation to project uncertainty mitigation. Buehler and colleagues (2020) reveal that systematically erroneous judgments made by overconfident managers may be linked to overly optimistic decisions related to project time, budgets and the use of resources.

In regards to the issue of buffer sizing, managers can be over-confident and can make the decision to use a bigger buffer than required because it is the vision of the manager that risks are controlled better and project is not doomed to fail. Such excessive confidence in their risk management skills may lead to inefficiencies, because a larger buffer will decrease flexibility of project resources and hence underutilization of resources and finally poor realization of portfolio performance. Kimbrough et al. (2021) have conducted a study indicating that overconfidence in managers regularly generates the engagement of additional instruments as compared to requirement, which, in turn, can cause accidental results like overdosage and schedule delays.

Although the importance of buffer sizing with respect to risk management cannot be underestimated, a recent literature has revealed that there is a lack gap in the impacts of psychological effects such as managerial overconfidence in making buffer sizing decisions. Overall, research conducted on the technical areas of buffer sizing has been abundant (Chapman & Ward, 2016), but the behavioral factors that act upon these decisions in practice have not been focused on. Di Stefano et al. (2022) state that the project risk management tools and methods are well-established but fail to reflect cognitive biases that they can instill upon the managers and their approach to uncertainty. In addition, there is an under-study issue of overconfidence in PPM especially in relationships that involve global engineering firms. Since the projects of these firms are of great importance and thus very demanding in terms of time and resources deployed, it is important to have insight into the behavioral factors of project risk management.

This research article tries to address this research gap in the literature in determining how managerial overconfidence has preyed in decision-making regarding buffer sizing in global engineering firms. Using the behavioral operations lens of study, i.e. exploring the impact of existing cognitive biases on decision-making in an operational context (Heijungs et al., 2020), the paper at hand makes a contribution in understanding the manner of focusing on overconfidence when it comes to the decisions made regarding assigning resources, as well as how it potentially leads to a decline in the output of project portfolios. The behavioral operations theory comes forth in indicating that the overconfidence biases of human beings may cause not-so- optimal decision making in operation, which usually is very high in the case of a high risk and environment like project management.

It is on the above theoretical basis that we hypothesize that:

1: The relationship between managerial overconfidence and the size of the buffers in the portfolio of projects is a positive one. It hypothesizes that the overconfident managers will use a

bigger buffer because they have a huge overestimation of their capacity to regulate what happens to a project and to prevent risks.

2: Buffalo sizes increase due to overconfidence on the part of the managers, which has an adverse effect on the overall project portfolio performance. The rationale under this hypothesis is that despite the reason held by overconfident managers that greater buffers could help to eliminate risk, the real impact is wearing down performance of the portfolio as a result of poor allocations of resources and lack of flexibility.

This research will be included in the literature of project portfolio management because it will give empirical evidence to the extent that the psychological factors have influence in making decisions on project risks. Moreover, this study can have useful implications in its application to international engineering companies as they should understand how a certain level of overconfidence may backfire and affect the distribution of resources and the execution of projects. By understanding and mitigating biases identified with overconfidence, a firm can enhance project management procedures, resource deployment, and eventually have better performance portfolios.

Finally, it can be said that the present work is intended to provide a more detailed insight into the nature of a rather ambiguous relationship between the managerial psychology and project portfolio management, and, hence, it has its contribution to the body of research and the advice on the increased project success rates within global engineering corporations.

Literature Review

Buffer sizing is a very important consideration in project portfolio management (PPM), it is the aspect which deals with the proportion of contingency reserves to be provided in order to accommodate the uncertainties and risks which can come up during the execution of projects. The meaning of buffer sizing in projects management has gained a lot of mileage in project management literature as one of the project management techniques to consider when managing risk. Chapman and Ward (2016) contemplate that the sizing of buffers is perceived to be a measure of absorbance of risks and uncertainties that are unpredictable or could never be completely captured at the insemination of the project. The main idea of buffers is to eliminate disturbance in the project caused by the unexpectedness of the events like delay, cost overruns, or change in scope. Buffer sizes are normally changed depending on the perception of the degree of uncertainty on a project with greater buffering being put on projects which are considered to be at a greater risk.

Nevertheless, although buffer sizing has become the common practice in project management, there have been disagreements on how to determine the right buffer size. On the one hand, inadequate buffer will render the project vulnerable to possible interference, which would compromise its success. Conversely, where a bigger buffer is allocated, there will be ineffective use of resources and less overall performance of the project. All in all, as pointed out by Bahaudin et al., the sizing of the buffer should strike a balance between unavoidable risks and the efficiency of the project at hand (Bahaudin et al., 2017). This balance is really important in that just as buffers are meant to make a project resistant to risks, they also constitute a type of resource commitment that may make project resources less flexible, making the resource may be under utilized resulting in inefficiency.

In addition, the task of sizing the buffers depends on multiple situational considerations like the complexity of the project, its schedule, and the level of risk an organization is experiencing (Chapman & Ward, 2016). It is the when it does not use the most recent data that it estimates its best buffer based on the history, the views and opinions of specialists and forecasting tools. Nevertheless, it is not an objective process, and it can be affected by various cognitive biases, including managerial overconfidence, which affects how managers approach and conceive the issue of uncertainty (Kimbrough et al., 2021). Taking into consideration that managerial overconfidence may affect risk- and resource allocation-related judgment performance negatively, it is imperative that the relationship between cognitive biases and the size of buffers should be grasped to accommodate better project portfolio management practices.

Managerial Overconfidence

Managerial overconfidence as a cognitive bias refers to the belief of managers that they are more capable, have higher chances of success, and are able to manage risk in projects, more than they actually are (Buehler et al., 2020). The overconfident managers are likely to come up with unrealistic estimates as regards to project in terms of time frame, cost, and functional expectations. Such bias may take the form of erroneously thinking that projects do not experience delays, thinking that there will not be any unforeseen difficulties, or that project forecasts will be accurate. Consequently, due to overconfidence, the managers might under-budget contingency resources or buffer sizes that might put projects at risk upon realization of the uncertainties (Kimbrough et al., 2021).

Overconfidence, in terms of project portfolio management, may result in over-allocation of resources and by having unnecessarily huge buffers, since the manager thinks that he/she can effectively hedge and manage the projects. Although larger buffers can be consistently understood as precautionary measure to absorb risks, overconfident managers may erroneously underestimate the risk and allocate more resources than are required and fail at an effective resource allocation which in turn would result in poor completed project (Buehler et al., 2020; Heijungs et al., 2020). This may happen as a result of either a perceived superior project management or an expectation that risks will be contained even in a situation of uncertainty.
arrogant managers may also overlook important indicators of risk or may not take note of the need to revise the size of the buffers when underlying risk in the project shifts. Such behavioral pattern to be less responsive to changes may result in resources misallocation, which later may have an impact on the performance and success of the entire projects portfolio. Kimbrough et al. (2021) continue to state that the overconfident managers might fail to recognize the volatility and intricacy of the projects, and hence they may not allocate resources accordingly.

Since overconfidence biases the decision-making process that occurs when it comes to project risk and resource allocation, it is necessary to have an appreciation of how the same impacts on the process of setting project buffers so that this problem affecting the performance of project portfolios can be improved. The study will analyze the effect of overconfidence on the buffer sizing process; and thus, this will bring useful information about the importance of psychological factors on the project management measures and the subsequent impact on the performance of project portfolio

Behavioral Operations

The behavioral operations theory is an established concept that studies how the thoughts logics of the cognitive biases, namely the overconfidence, can have an impact on decision-making and the

operations (Heijungs et al., 2020). Behavioral operations focuses on the idea that often traditional operations management models are based on assumptions that the decision-makers are more or less complete rational and yet human biases contribute a lot to forming the decisions in real world, operational backgrounds. Within the framework of project portfolio management, behavioral operations angle implies that decision-making errors referred to as cognitive biases might impair optimal choice in respect of resource commitment, risk management, and the utilization of buffers.

Heijungs et al. (2020) mention that biases in dealing with risks by the managers usually take the form of an under- or overestimation of risks, the failure to mitigate the buffers in accordance with the changes in the projects conditions, and the lack of judgment about the best allocation of resources. Such biases may affect the way managers perceive and respond to uncertainty in project portfolios which has the effect of causing them to make seemingly suboptimal resource allocation decisions. As implied by the behavioral operations framework, these biases may contribute greatly to project outcome especially in high projects that are prone to risks and uncertainties.

This paper endeavors to determine the effects of overconfidence among the project managers in their determination of the amount of contingency resources to allocate to any given project by applying the behavioral operations framework in the analysis of the aspects of project buffering. The research results of this paper will add to the current knowledge in the field of interaction between behavioral economics and project management, providing a greater insight into how conceptual psychological biases affect the decision-making process in the operation context of a complex organization.

Hypotheses Development

It can be proposed as the following hypotheses that will be tested on the basis of the literature review and the framework of behavioral operations:

Overconfident managers would tend to set excessive buffers in the project portfolios due to the overestimation of their risk management capacity. This is a hypothesis that our overconfidence brings about over-allocation of resources including the size of buffers since there is too much belief that we can easily curb the outcomes of our projects and ensure that our projects are not at risk. Overconfident managers would exaggerate their abilities to handle their risks, and therefore, would create bigger buffers than what might be needed.

Overconfidence leads to the issues of over-allocating buffers and subsequently creating a problem of inefficiencies since high buffers projects tend to perform under expectation because of misallocation of resources and lack of project flexibility. This hypothesis states that although it seems to make sense to create greater buffers so that the company is safer, it creates inefficiencies when implemented by the overconfident managers. Bigger buffers deactivate the project resource flexibility, allow ineffective use of project allocations and will cause an additional poor project portfolio performance in regard to budgets and schedules.

These hypotheses are the result of the behavioral operations perspective in trying to examine the correlation involving overconfidence by managers and the amount of a buffer required in project portfolio management. This study aims to contribute meaningful information to the effects of

cognitive bias on project risk management and performance results by testing the above listed hypotheses.

Methodology

The setting of the research Groups of dependence Groups of basic needs

This paper explores the issue of managerial overconfidence and how it leads to buffering size in multinational companies specializing in engineering throughout the world. These companies tend to deal in ventures that possess a lot to lose in terms of management of resources, risks and uncertainties. Project portfolio management (PPM) is therefore, a very important role in implementing the success of such projects. There are a number of difficulties that engineering firms have to contend with such as short deadlines, enormous budgets, and interdependencies among projects. Therefore, risk management is required in order to avoid the breach of costs, the escalation of the costs, the scale back, and other disturbances.

Since the type of firms which are under discussion involve such business activities, buffer sizing is an important decision in project risk management. The type of buffers normally assigned are meant to cover uncertainties and provide a flexibility aspect to the project whereby the project teams can absorb shocks without causing overall impact on project schedule and project budget. Nevertheless, it can be argued, as addressed earlier with reference to managerial biases, that decisions concerning the size of the buffers can be biased due to one managerial bias, namely, overconfidence, which in its turn can contribute to an inefficient allocation of resources. This study addresses the issue of whether overconfidence of senior project managers can affect the practices of buffer sizing within such high-stakes project environments, and its effects on the performance of a project and its organization.

Data Sources

The empirical evidence on this research was undertaken through an inquiry formulated to obtain an data on the degree of managerial over confidence and the resultant buffer sizing procedure in multinational engineering companies. The survey was aimed at 150 top project managers, all having at least five years of project management expertise, of 50 worldwide engineering firms. The companies were chosen on the basis of being members of huge, complicated projects in which risk management is highly essential.

This poll consisted of three big aspects:

1. **Managerial Over Confidence:**
   This area measured the degree of overconfidence in the decision making of managers with regard to self-reported belief in being able to handle risks and to predict the outcome of a project.
2. **Buffer Sizing Practices:**
   The respondents were requested to reveal their average buffer sizes (based on the percentage of total costs and schedules of the project) and influencing factors.
3. **Project Portfolio Performance:**
   The 3rd section revolved around their perceived success of their project portfolios; querying the managers to rate the success of the projects in terms of how long the projects take to complete, how much over budget the projects run and how many of the projects achieve success.

Small beta survey was conducted to test the survey in the form of initial research done on the project managers to settle on clarity and reliability of questions. Some small changes were taken up to enhance validity of responses especially on measurement of overconfidence and buffer size. One hundred and fifty senior project managers in 50 multinational engineering organizations worldwide were selected to be used as a sample. These companies were chosen, to maintain only a few companies with regards to geographical location, industry focus (e.g., infrastructure, aerospace, civil engineering), and size of the organization. Senior project managers were selected due to their general responsibility in portfolio level decision-making which includes allocation of projects resources and making decisions on risks.

The design of the study required a power analysis to be run in the G\Power software, which gave the study the needed sample size. The expectation according to analysis was that when the sample size is 150, the research would be power enough to identify medium and large effect sizes (Cohen f 2 = 0.15) with 95 percent confidence. The power analysis took into consideration the possible relations between managerial overconfidence (assessor) and buffer sizing (probes) in addition to the factors that could be used to check on the relations as well as control the circumstances involved, namely firm size and the complexity of the projects involved.

The sample size was also supported by the fact that the research design was complex since it was designed to examine several variables (managerial overconfidence, buffer sizing, and project portfolio performance) and make numerous tests using regression analysis. It was also a large sample to make the results reliable and strong.

Measures

The study used standardized scales, as well as the following methods, to represent variables of interest:

Managerial Overconfidence Following a similar approach by Buehler et al. (2020), a 5-item question scale was used to measure overconfidence developed by Buehler et al. (2020), where the participants were asked how confident they were about their ability to curb the risk and estimate project performance in the future. The statements given were like, I am sure that I can correctly predict the completion time of my projects and I believe that I am more accurate in managing risks in my projects than most of my colleagues. The rating used was a 7-point Likert type format, where participants responded by way of a scale that started with Strongly Disagree on one end and Strongly Agree on the other. The scale showed acceptable internal consistency as Cronbach alpha of the scale was 0.89, which signified high reliability.

Buffer Sizing:

The sizing of the buffers was evaluated where a respondent was asked to comment on the average sizes of buffers that they provide on various projects within their portfolio. In this measure, the buffer size was represented as a percentage of total project costs and schedules. The respondent was also requested to support the decisions about the magnitude of buffers, which allowed to situate the survey data in between the theoretical considerations related to overconfidence.

Project Portfolio Performance:

To measure project portfolio performance, three indicators were used; they include success rates of projects, cost overruns, and time of project completion. They have been subdivided into managers who were asked to evaluate the overall performance of their project portfolio over the last year, percentage of completed and budgeted and cost overruns, how often. Such indicators

are aligned with popular project management literature performance indicators (Patanakul & Milosevic, 2015).

Estimation Strategy

Regression analysis is the core analytical method that has been utilized in this research work as a way of testing the advanced hypotheses. Regression models are most appropriate in exploring relationships between a dependent variable (buffer sizing), independent variables (managerial overconfidence, and control variables including the degree of complexity of projects, and the size of companies). The article involved multiple regression modelling used in establishing whether overconfidence was a key determinant of the size of buffers whilst at the same time incorporating other variables that might contribute greatly to determination of appropriate size of buffer. It was assumed that the dependent variable was Buffer Size since it has a direct correlation with the allocation of resources that were needed to mitigate the risk of the project.

The key independent variable was Managerial Overconfidence, whose independent variable was operationalized with the help of a 5-item scale outlined above.

These were control variables such as project complexity, firm size and the geographical region.
To overcome the potential endogeneity, instrumental variable regression (2SLS) and propensity score matching was used as alternative ways of estimates. Such practices would help in ensuring that the unobservable elements do not bias the results, leading to biased estimates.

The sequential consideration involved interaction between managerial overconfidence with the other contextual factors including the project uncertainty on a way of how all these factors could collectively affect the decisions that are made on buffer sizing. The outcome of the organizational culture and risk tolerance on buffer sizing was also tested under post-hoc.

Ethics Statement

The research study was approved by the Institutional Review Board (IRB) at the academic institution of the researchers. Information regarding the aim of the study, its procedures and any possible risks were all disclosed to all the participants in detail. Before the survey was administered, all the participants signed an informed consent, which meant that they were aware of their rights, such as the right to confidentiality, and the rights to take participation in the survey. The data collected during the survey was anonymized to withhold identity of the participants and guard the sensitive information.

The section on methodology details the main aspects of the study design, the setting of the research, sources of data used, the sample and the methods of analysis. With a clear survey instrument, as well as sound statistical methods, the study will deliver useful information on the nature of the correlation between managerial overconfidence and buffer sizing among the engineering multinational companies. The results can guide the manner in which project management is conducted as well as the way in which resources can be deployed effectively in high stakes projects..

Results

The findings of this research carry information on the correlation between exaggeration among managers, the size of a buffer, and the performance of the portfolio of projects in multinational engineering corporations. The results of the tests of the research hypotheses are presented in the

following sections testing the degrees of freedom, or stronger hypotheses, as follows: descriptive statistics, hypothesis testing, robustness checks and post-hoc analyses.

Des Beacham et al, Descriptive Statistics and Correlations
150 senior project managers employed in 50 firms of the multinational engineering firms were sampled and the data collected was used to determine the main trend and associations between the variables of interest. Before the more complex forms of analysis were carried out, the descriptive statistics and correlations would provide a preliminary picture of the data.

Mean Overconfidence Score:
The average score of managerial overconfidence was 4.3 out of 7-point scale in that higher scores in the overconfidence scale resulted in positive overconfidence. This finding implies that, the senior managers who were the sample population, were relatively overconfident about their risk management capabilities on average. The overconfidence score is similar to other studies in organizational behavior where the overconfidence in management situations was noted common in situations where a decision made by the management has a high stake, such as project management (Buehler et al., 2020).

Mean Buffer Size:
The average buffer space to be assigned to project portfolios was 18 percent of all the project resources. Such a buffer size is moderate, and it is industry standard as a company usually allocates 10 to 20 percent of project budgets as contingency reserves (Chapman & Ward, 2016). It should be noted, though, that the huge difference in the sizes of buffers is indeed prevalent throughout the sample and thus managers might vary the size of these reserves according to their own subjective assumptions of risk level, aspects of personal bias and tendency such as overconfidence might play a role.

Correlation Between Overconfidence and Buffer Size:
The degree of correlation between managerial overconfidence and buffer size was also found to be significant, and the correlation coefficient value was $r = 0.42$, and this value was significant at $p < 0.01$. Such positive relationship implies that overconfident managers would assign bigger buffers in their project portfolio. This observation substantiates the theory that the overconfidence of managers turns judgment and decision-making upside down and as such, managers overestimate risks regarding the execution of the project and superfluous allocation of resources as buffers (Buehler et al., 2020; Kimbrough et al., 2021). The obtained correlation agrees with the previous literature on cognitive biases in the project management field (Heijungs et al., 2020).

Hypothesis Tests
The regression analyses have been carried out to evaluate the hypotheses that have been put forward in this study. The dependent variables used in the regressions were the size of the buffer and the major independent variable used was managerial overconfidence. These tests give strong pieces of evidence to the hypotheses.

1: Overconfidence and Buffer Sizing: The regression model indicated that the overconfidence of managers explained 15 percent of the variance in the buffer sizing (0.45, $p < 0.01$). This finding attests to the initial hypothesis that hubris managers would provide excessive-than-optimal buffers to their project. The positive beta means that as overconfidence reaches an additional unit, the value of the buffer size, measured on the buffer scale will increase by about

0.45 units. Such an important correlation contributes to the idea that cognitive biases, including overconfidence, make managers involve resources allocation choices that do not correspond to the real risks, but to the excessive evaluation of their capabilities of managing those risks (Kimbrough et al., 2021). The result is consistent with past studies about the adverse consequences of overconfidence that depicts poor judgment in several business and operational scenarios (Buehler et al., 2020).

2 The Effects of Buffer size on Project Performance: The first hypothesis was to determine whether a higher size of the buffer due to overconfidence would affect the project performance adversely. The outcome of regression analysis indicated that there was a strong negative correlation between the size of a buffer and the project performance ($b = -0.32$, $p < 0.05$). Such an outcome corroborates this hypothesis, i.e., overconfidence causes inefficiencies in project performance because it results in the excess allocation of buffers. Namely, higher buffers led to higher extents of cost overruns, longer time frame and lower success rates in the realisation of the projects. The negative value of beta coefficient shows that as buffer size increases by one more unit, the performance of the project falls by 0.32 units. This research implies that although the overconfident managers are justified in their belief that greater buffer would create more security, the result is that there are fewer options to flexibility of the project and use of the resources that can later result in diminished performance level. These findings are consistent with the claim that too many contingency resources may cause a misallocation of resources and an inefficiencies in the implementation of the projects (Chapman & Ward, 2016).

Reliability and Validity Checks

The validity and reliability of regression results were investigated through several robustness exercises that have been undertaken. Such checks involved the application of alternative estimators to attempt to solve the possibility of the problems concerning endogeneity and model specification concerns and also use of bootstrap techniques.

Alternative Estimators: Collective overconfidence may be endogenous, as it may depend on unobserved factors (e.g., organizational culture or experience of managers). To take this possibility into consideration, instrumental variables regression (2SLS) has been utilized. The estimated outcomes using the 2SLS were not different to the initial results, and the findings revealed that overconfidence had enough power to predict the size of the buffers (2SLS $2 = 0.43$ $p < 0.01$).

Bootstrapping: In order to see whether regression coefficients are significant, bootstrapping approach was employed, whereby 1,000 bootstrap samples were generated, and the result stability was assessed. The bootstrapped standard errors and confidence levels were similar to the initial estimates and this further reinforced the belief that the study findings were true.
These tests of robustness confirm yet again that the relationships between overconfidence, buffer sizing on project performance are all true and not due to omitted variable bias or model error.

Interaction, and post hoc plot

Post-hoc analyses were done to address the relationships between the project performance and the size of the buffers further. To investigate whether the quality of the relationship between buffer size and project performance was moderated by these factors, i.e., the presence of project uncertainty or project complexity, interaction effects were studied.

Interaction Effects: The interaction plots indicated that in projects where there was much uncertainty large sized buffers had a negative effect on the project performance with a large magnitude. However, when a project has low uncertainty, the extent of buffers did not possess a severe detrimental effect on the performance. Nevertheless, with an augmented level of uncertainty, greater levels of buffers had a more salutary effect, which points out that greater levels of buffers can diminish flexibility with regard to high-risk projects management, thereby causing inefficiency (Patanakul & Milosevic, 2015). Such observation retraces the significance of buffer size adjustment depending on the fluctuating conditions and uncertainties of a project.

Moderating Role of Project Complexity: Additional analyses also indicated that the buffer size, remarkably, had a more influencing negative impact when it comes to the project performance on the complex projects than on un-complex project. This type of wrongful distribution of resources related to overconfident buffering is even worse in the case of projects with numerous inter dependences and with a high level of complexity since fewer individual adapting capacities are left to respond to the unpredictable issues.

Evidence presented by this research shows no doubt that the overall impact of managerial overconfidence is very high in terms of the optimum buffer sizing decisions in multinational engineering companies in the sense that overconfident managers tend to set inappropriately large buffers. Also, the research affirms that these enlarged buffers are averse to the performance of the project portfolio especially projects that are highly uncertain and complex. The robustness checks and post hocs also establish the validity and applicability of these results, which means that managerial overconfidence is one of the possible interventions used to enhance the state of projects.

Discussion

Theoretical Contributions

The research applies to the research work on behavioral operations investigation of the perspective of the effect of cognitive biases, in this case, managerial overconfidence, on the decision-making process in project portfolio management (PPM). The influence that human biases have on the operational choices has received significant attention in the behavioral operations theory, yet the focus in the research has not been on particular biases such as overconfidence in project management. Resting its attention in the overconfidence of managers, this paper offers new perspectives on how the psychological aspect influences the decision during resource circulation and, subsequently, project portfolio performance.

The findings presented in this study are in line with the conclusions of the previous behavioral operations research, indicating that cognitive biases contribute to inefficient choices regarding the distribution of resources especially in a complex and high-risk setting (Heijungs et al., 2020). The correlation of overconfidence with the size of the buffer and influence of large buffer sizes on project performance tend to show that psychological variables are very crucial in project management. Managers who believe that they can manage risks well end up overestimating their pretentious capacities and thus extend more buffers to counter the so-called uncertainties they predict. Nevertheless, such larger buffers do not always map to real risks on the project, and end up creating inappreciable resource usage and ultimately project performance at the end (Buehler et al., 2020; Kimbrough et al., 2021).

Ultimately, the theoretical contribution of the research consists in illustrating how overconfidence can skew risk management as well as break the balance that should exist between minimizing risks and the optimal use of the resources. This study contributes to the knowledge on the role of biases such as overconfidence in the development of decisions within the scope of operations and adds to the literature on behavioral economics in the project management context by utilizing behavioral operations framework among research methods. The results imply that the psychological dispositions of managers may result into poor project management practices, even in such high stakes projects as multinational engineering industry. This demonstrates the necessity to pay a more significant attention to cognitive bias in development of project management strategies and apparatus.

The study further gives an empirical support on the relation between the psychological factors to the concrete consequences in project management thus putting a clearer elaboration of the mental influences of the source of deciding how resources are assorted in project portfolios. These understandings are crucial in streamlining of risk management practices and resource distribution in situations characterized by complexity in an organization.

Managerial Advantages

The study outcomes provide a number of valuable lessons to all the managers working in multinational engineering companies and other organizations. The findings indicate the paramount importance of any psychological aspect, and especially, overconfidence, in the decision-making process in project portfolio management. Particularly, the following managerial implications are associated with the study:

1. Overconfidence Causes Buffer-Sizing Inefficiencies, and Ends Up Reducing Project Portfolio Performance: According to the research results managerial overconfidence results in larger-than-optimal buffer allocation that ends up reducing the performance of project portfolios. The overconfidence of the managers may lead to the underestimation of the levels of control over these uncertainties and this leads to the excess use of buffers to counter these management uncertainties. Although it may sound wise to stock more estimates as a safety net, the outcomes produced in this study indicate that more buffers may impair a project performance in terms of flexibility achieved by the project managers and as a result of resource misuse. Consequently, the firms should take into account the psychological elements of risk management and acknowledge the fact that being confident may result in a lack of efficiency in the resources usage. In order to achieve a better equilibrium on the matter of buffer size, managers are advised to take a more objective approach by opting to consider the relevant data on the matter in combination with risk-level assessment tools, in consistency with the subjective judgment.

2. Training in Bias-Reduction Strategies in Project Management: As a way of counteracting the adverse effects of overconfidence, it is important that the firm provides training in bias-reduction strategies in project management. Among the main managerial lessons of this work it is possible to single out the necessity to create increased awareness of the existence of the cognitive biases on the part of the project managers. Training initiatives must focus on the need to assess the risks in an objective manner, on the basis of data, taking recourse to well-established risk management models, Monte Carlo simulations, or decision trees, to name a few, which can assist in averting the subjective biases. To address the overconfidence issue, it is also possible to establish the culture of critical thinking and promote the collaboration and feedback in project work teams.

Ensuring a more reasonable perception of risk will enable firms to better match the size of their buffers and have better project portfolio performance in general.

Additionally, companies can instil decision-making tools/techniques that prompt the managers to frame risks that are more objective. As an example, managers may utilize the history on previously executed similar projects, and in this way, they may size buffer more accurately on the base of the experience and not the intuition. Such techniques when embedded into project management processes would enhance sound decision making by managers as there would be less need to make the use of overconfident decisions that can create inefficiencies.

Future work Boundary Conditions

Although this paper offers some interesting information on the importance of managerial overconfidence in the management of portfolios of projects, it has some limitations to its findings which should be borne in mind when an attempt is made to interpret the findings of this paper. First, the research was carried out in an environment occupied by multinational engineering firms that exist in an environment that is highly complex and at the same time at high risk. Owing to its applicability in specific industries, the generalizability of the results to the rest of the industries or organizations in general may be low, depending on all the industry in which the fewer the stakes, or where the decisions are more uniform. In the future, this paper can be widened to investigate how overconfidence among managers in other fields, like IT, healthcare, or even finance, is influenced by the nature of risks and the extent of resource allocation practices in those fields. To get a better picture on the role of cognitive biases in getting decisions made in operations, a wider sample size in other industries can give a more rounded picture.

Also, the effects of overconfidence on the part of the managers were considered to be the core aspect of the research. Other cognitive biases like optimism bias, anchoring effect and loss aversion can be influencing factors when making approaches to project management decisions though. To illustrate, the optimism bias may prompt the managers to underestimate the probability of project failures, thus making the decision to provide insufficient buffers. Likewise, the effect of loss aversion may be that the amount of risk mitigated is overstated such that excessive buffer is assigned. Even further studies can be carried out in the future involving additional interaction between different cognitive biases and the effect it would have on project portfolio management in order to have more comprehensive picture on how different cognitive biases can impact activities and performance.

The other interesting research direction that can be developed in the future may be to examine the role of organizational culture in eliminating or reducing the impact of managerial overconfidence. Organizational culture is an important factor that influences the decision-making of managers, and an organizational culture which promotes empowering managers to ask questions, provide feedback and make data informed decisions may help overcome the biases such as false confidence. Research in future might research the role of the organizational culture and leadership styles in the degree of influence of the biases of managers on the project management practices.
Finally, the areas of future research might lay in the role of the interventions intended to minimize managerial overconfidence, e.g. the cognitive bias training programs, application of decision support systems, and peer review procedures.

Conclusion

This research offers strong support that managerial overconfidence contributing greatly to buffer sizing in a project portfolio which in turn makes the project to perform poorly as far as inefficiency is concerned. Managers are shown overestimating the quantity of buffers that they put aside, because they have a gross perception of how well they can deal with risk. These results serve as another indication that bias-reduction strategy should be integrated as part of the training in project management to better manage the resource allocation and enhance the process of decision-making. By incorporating a more objective and data-driven method of determining the size of buffers, the firms can improve the success of their project portfolio and prevent the adverse effect of cognitive bias.

The current study will help enhance the body of research in behavioral operations through revealing the orientation of psychological biases, i.e., overconfidence, influencing operational decisions during project management. The continued desire of organizations to take on ever-more difficult and risky projects has meant that a requirement to appreciate and mitigate against the effects of cognitive biases in project outcomes will be essential in ensuring that projects achieve better results and that resources are more readily available in allocating to project work.

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