

Integrating risk management with financial analysis: A Project Manager's approach

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Abstract

This research seeks to compare and merge risk management with financial analysis within project management to determine how the integration impacts project behavior and performance in different industries. The empirical study of the research is based on a multiple case study methodology and covers the construction industry project, the IT project, the infrastructure project, as well as two energy sector projects, with an emphasis on the application of tools and techniques implementing the risk and financial functions. The research establishes the positive correlation between risk management and financial analysis and shows that integrated implementation of these techniques leads to better cost management, more accurate project cost estimation, increased control of project risks and, therefore, improved results compared to planned objectives. Some examples include the Highway Expansion (construction) and the Oil Refinery (energy), which show how techniques such as Monte Carlo simulations and sensitivity analysis coupled with scorecards aid early decision-making and resource management for the achievement of improved results. On the other hand, such projects as the Software Development (IT) case study indicated that poor integration of risk management practices was characterized by financial overruns and project delays. The research discusses the issue of cultural resistance, tool sophistication, and data quality, all of which constrain the integration of these functions. In sum, the results underscore the necessity for an integrated approach to risk and financial management, especially in mega-high-risk projects, and provide directions for the applications of the tools for achieving it.

Keywords: Risk Management; Financial Analysis; Project Management; Monte Carlo Simulations; Cost Control; Sensitivity Analysis

1. Introduction

When looking at the current and actual state of project management, one has to say that integrating the risk management concept with the financial business analysis is critical to project success. With the bouts of project complexities and size, project managers are under pressure to manage risks, costs, and project performance. This dual responsibility becomes even more important in industries ranging from construction and infrastructure to technology and finance where managing only one of the professional's key quadrants can lead to cost overruns as well as project delays and in extreme cases, project abandonment (PMI, 2017).

Risk management and financial management have over the years been executed independently of each other within project management. The distinction between risk management and financial management is that risk management concerns itself with identifying, evaluating and minimizing risk that is likely to pose a threat to the achievement of a project's targets, while financial management involves planning for, controlling, and allocating funds towards the accomplishment of a project's objectives (Sabahudin and Manish, 2013). However, the increased dependencies between the project risks and its finance calls for a more combined strategy. It is only possible if risk identification and risk management are synchronized with the process of financial analysis will enable project managers not only to address potential risks but also to match those risks with available resources.

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When the two important processes complement each other, they will enhance decision-making, and resource allocation and therefore, increase the chances of success in projects. When these two functions are not integrated, there can be poor financial management and the possibility of risks being overlooked whereby which will act against project performance and the ability of the project to achieve time and budget targets Zwikael and Ahn (2011). Consequently, a need to examine how these two concepts could be integrated with the project management system in a way that creates synergy between risk management and financial analysis throughout different stages of the project life cycle.

The purpose of this research is to establish how risk management and financial analysis interconnect in project management, with a particular focus on how the coordination of the two fields enhances the effectiveness of project results. The primary objectives of this research are:

- To examine the theoretical underpinnings of risk management and financial analysis, and the importance of their integration in project management.
- To investigate the benefits and challenges associated with integrating risk management and financial analysis.
- To propose practical frameworks, tools, and methodologies that facilitate the integration of these disciplines.
- To analyze case studies where the integration of risk management and financial analysis has been applied successfully or where it has faced challenges.

This research is relevant to project managers; financial analysts, and organizational leaders because the findings will aid in the enhancement of project management efficiency by integrating risk management strategies into financial planning and vice versa. In the first place, it is important to understand the interaction of risk management and financial analysis, their relevance to the present conditions of business environment instability and their direct impact on the success of project implementation. When it comes to risks, they expand from the limited economic impacts to the incorporation of technological, environmental and even regulatory risks which make projects vulnerable to variability. Financial decisions, which have for long been entail cost control initiatives such as estimating costs and control costs, may be enhanced by risk analysis with a broad focus that considers the likelihood of occurrence of events with adverse impacts on the total project value (Florice et al., 2014). However, as the functions become more diverse, it is easier to integrate with the development of newer project management applications and different analytical tools that may inform the project staff with real-time information to make important decisions (Marle et al., 2015). Risk analysis based on tools like Monte Carlo simulations, scenario development and sensitivity analysis helps make financial analysis much more dynamic throughout a project while targeting risk factors (Vose, 2008). It allows the project managers to forecast issues in advance, and control the budget and time allocated for the project, then make effective decisions to reduce possible risks as much as possible. Studies on project management practices have mostly covered financial analysis or risk management while a scant few have discussed how the two fit together (Elkington & Fennell, 2012). However, as the project's size and diversity have been progressing, there is increasing awareness that these two areas are critical and should be merged to guarantee the projects' financial accountability as well as risk control. This paper will seek to establish how the task of risk management and the process of financial analysis can be incorporated by project managers in their projects to enhance project performance.

There is also growing literature evidence showing that risk and financial management is another area that has received attention in project management given recent developments in the theory and practice. In the same year Report of the Project Management Institute, a Project completion survey found that 43% of projects failed mainly due to poor risk management and 35% of projects incurred more than 20% more than their budget simply because the financial management aspect was not well managed. Such numbers illustrate the need to address both the financial and the risk aspects as a weighty and integrated approach.

More specifically in construction and infrastructure projects, where cost estimates may run into millions and time spans over several years, risk and financial analysis integration have been found helpful in minimizing the incidence of massive project delays or cost blowouts (CIOB, 2020). In the technology sector where there is much ambiguity about the market conditions, the technical viability of the project or the availability and costs of resources this integrated approach assists in reducing the risks of cost overruns and delays (Kerzner, 2018). However, in the new environment characterized by the use of agile methodologies and tools in managing projects, integration of risk data and financial data in real-time is possible hence enabling the project manager to real real-time adjustments to the financial and risk management strategies of the project. This constant feedback loop makes project management more agile and thus efficient, a very important aspect especially given that the business environment is ever dynamically complex (Leach, 2020).

2. Literature Review

It is argued that control of risks and financial resources is critical for project management interventions. Even though risk management and financial analysis are two concurrent processes that are inarguably parts of proper project management, they are commonly philosophized and implemented as two quite different horses of various colors, possessing their processes, methods, and instruments. Nevertheless, project risk management has become more intertwined with project finance in the approach to contemporary project management necessitating integration to boost results.

2.1. Conceptual Overview: Risk Management and Financial Analysis in Project Management

Risk management in project management is the process of identifying, analyzing and selecting appropriate responses to potential risks that Threats. It encompasses four key phases: The recognized stages of risk management are risk identification, risk assessment, risk response planning and risk monitoring and control (PMI, 2017). Based on Hillson's article from 2017, the traditional approach views risk management as a concept, which is accomplished after losses have occurred. However, the approaches are more proactive as they try to crystallize potential threats as early as possible and adapt a strategy to mitigate them.

Business analysis, in turn, is more focused on the examination of the financial aspects of the project and may include cost control and estimation, budgeting and financial modelling, as well as cash flow and profitability calculations. One of the main considerations of financial analysis is the ability of a given project to operate within a specific project's finances or budget and at the same time add value to the network. There are certain indicators, which are applied to measure the economic feasibility, namely Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP) to make a financial decision regarding a project. Campbell and Kiko, 2011 state that good financial management is the management of funds with a view of avoiding wastage of the resources and avoiding losses through emergency funding.

But, despite their tactical significance, risk management and financial analysis are typically carried out in isolation in most firms. It may also become uncoordinated because the organization's financial planning does not consider all the risks that might affect the financial operation of the identified project. On the other hand, risk management controls may not weigh the financial capacity needed to address these risks effectively. It is for this reason that these two functions need to be integrated into today's projects, to afford the project managers the task of managing both the risk and the funds needed to fund the projects.

2.2. Theoretical review

The integration of risk management with financial analysis is not just a practical necessity but has also been the subject of significant theoretical development. There has been discussion on how the integration of risk and financial factors can be done and several models have been developed each providing a different approach.

An exciting theoretical model is the Risk-Based Decision-Making model, which incorporates the usage of financial analysis into the risk management strategies. Vose also contends that this model allows project managers to assess the risk of financial losses based on the likelihood of risk and its impact on the cost and timeline of the project. Thus, when risk data is incorporated into the act of financial forecasting, this method assists the managers in the correct assessment of the potential for financial loss and improved financial planning and resource allocation.

Real Options Theory (Dixit and Pindyck, 1994), which is another widely discussed theoretical concept in this area, utilizes the theory of financial options on project management. Real options theory acknowledges the fact that managers operate under conditions of risk and can exercise option flexibility. This flexibility, including postponing, broadening or even halting the project phases, has value because circumstances can be taken into consideration. Financial analysis becomes combined with risk management when estimating the value of these options and their effects on the potential project's financial results (Benassi et al., 2019). This paper argues that real options offer a sound approach to decision-making when there is uncertainty in the environment, is consistent with the financial perspective and considers risk factors.

In addition, the Integrated Risk and Financial Management (IRFM) Framework, developed by Floricel et al. (2014) is one of the complex instruments that highlights the possibility of risk management and financial analysis. Both of these functions have to be in contact with each other and work in tandem for the duration of the project. This is because the paper indicates that risk assessments should be conducted and incorporated into the models of financing while the strategies of risk management should draw from the aspects of financial constraint. When these functions are

coordinated, this that is provided by the IRFM framework can help the project managers to make good decisions with a view of utilizing available scarce resources efficiently in a way that enhances the performance of the projects.

Besides the theoretical models, several quantitative instruments have been also designed for the integration of risk management and financial analysis. Among all the tools the most commonly used one is Monte Carlo Simulation. This technique employs the use of random samples and statistical models of projecting the overall outcome of a project given the variability that is institutionalized when making the projection models and other risks. Monte Carlo simulations contain a probabilistic analysis of the project that can be seen from different angles of the risk situations generated by the model. Marle et al, (2015) confirmed this by explaining that the tool has been most viable in construction and engineering projects because that is where risks are unpredictable and capital low.

Another quantitative tool in this context is called the Sensitivity Analysis which estimates the project plan's performance as the key project variables of cost, time or market conditions of the project are changed. Indeed sensitivity analysis also involves changing the inputs of financial models and risk assessment to determine which inputs have a huge impact on the results of the project. This technique makes it possible for project managers to rank risk factors for resource allocation to areas of most importance in terms of the overall financial benefit and risk management plans (Vose 2008).

Besides, the Earned Value Management (EVM) tool has been implemented and linked with risk management as well as financial analysis mechanisms used in project management. EVM monitors the value created as planned compared to the value accomplished, which gives an early indication of cost overruns or schedule duration. EVM if used in conjunction with the risk assessments then becomes a strong tool used for changing project plans in light of risks as well as for managing both fiscal and operational risks (Marle et al., 2015).³ Empirical Evidence on Integration several quantitative tools have been developed to assist in the integration of risk management and financial analysis. One of the most widely used tools is Monte Carlo Simulation. This technique uses random sampling and statistical models to simulate a range of possible project outcomes, accounting for the uncertainties inherent in both financial projections and risk factors. By generating multiple scenarios, Monte Carlo simulations provide a probabilistic view of the project's financial performance under different risk conditions. This tool has been particularly useful in construction and engineering projects, where uncertainty is high, and financial resources are limited (Marle et al., 2015).

Similarly, Sensitivity Analysis is another quantitative technique that evaluates how changes in key project variables (such as costs, timelines, or market conditions) affect overall project performance. By varying the inputs in financial models and risk assessments, sensitivity analysis helps identify which variables have the greatest impact on project outcomes. This technique allows project managers to prioritize risks and allocate resources to address the most critical factors, thereby optimizing both financial and risk management strategies (Vose, 2008).

Additionally, Earned Value Management (EVM), a widely adopted tool in project management, has been integrated with both risk management and financial analysis to provide a comprehensive view of project performance. EVM tracks project progress by comparing the planned value of work to the actual value, providing early indicators of cost overruns or schedule delays. When combined with risk assessments, EVM becomes a powerful tool for adjusting project plans based on potential risks, ensuring that both financial and operational risks are managed proactively (Marle et al., 2015).

2.3. Empirical Review

New empirical research has demonstrated that risk management and financial analysis integration enhances project results. For instance, a study carried out by Kerzner (2018) concerning IT projects indicated that increased use of risk management covering project financial analysis led to enhanced results with reduced costs and prolonged time. Likewise, Zwikael & Ahn (2011) in the construction field concluded that strategic risk assessment in financial planning has a positive impact on efficient resource estimations and in the construction time and cost overruns.

Furthermore, Elkington & Fennell (2012), who studied managing risks of large infrastructure projects gave conclusive proof that inadequate finance and risk workforce integration powerfully influence costs and time tragedies. In comparison, combined risk assessments that were used to develop decisions about financing or budgeting illustrated a much lower level of both financial and time risk. This stresses the correspondence of financial and risk management procedures for the greatest understated projects that are more threatened and require substantial resources.

Moreover, a case of a large-scale energy project identified by Marle et al. (2015) also reported that both the risk and financial information were dynamic. Having such data integrated enabled the project managers to adapt the financial forecasts about new risk information to produce more accurate predictions and balance control over costs within the projects.

Although several theoretical advantages exist in integrated practice, several papers indicate relatively common problems in the integration process. A report by PMI (2021) notes cultural resistance as another cruciate stating that organizations continue viewing risk management and financial analysis as two distinct disciplines. On the same note, other challenges include: the complexity of the tools needed in the integration process and lack of skilled personnel. Nonetheless, as exemplified by the case studies shown in this paper, top organizations that synch risk and financial functions are less vulnerable to facing the challenges of current projects.

There is another area of study estimating the difficulties organizations encounter when trying to incorporate risk management with other financial analyses. Several of them have been identified by Floricel et al, (2014), and below is an outline of them One of the main issues that needs to be addressed is the organization culture, where risk management is realized in the context of organizational structure more like an organizational subfunction, and where financial analysis is realized mostly in terms of cost minimization instead of risk management. This kind of approach does not allow for proper interaction between the risk and the financial personnel, as well as prevents integration.

Another difficulty is the fact that several tools and methodologies applied to managing risks and analyzing finances are rather sophisticated. Techniques such as the Monte Carlo simulation and real options are relatively complex and may not be within the grasp of every organization due to skills deficits. Despite the advantages of these tools being rather powerful, the sophistication of many can complicate the interpretation of the results and application of outcomes, thereby contributing to decisions that are less than ideal (Vose, 2008).

Last is a lack of data availability and quality which poses an integration challenge. Financial projection and risk analysis require timely and quality information. But, compromising with quality data especially when data is coming from multiple sources could be challenging. Incorrect information or lack of data in time can be obtained while defining the financial expectations or the risks which harm the improvement of the integration (Kerzner, 2018).

Although there are considerable theoretical and practical benefits of linking risk management and financial analysis, organizations experience challenges when trying to integrate the two elements. Firstly, risk is still understood as an unrelated issue while the financial analysis remains mainly cost-oriented rather than risk-centered (Floricel et al., 2014). This approach prevents synergy between risk and financial personnel in an organization and the ability for efficiency integration as well. Another issue is related to the increase in the level of heterogeneity in tools and methods employed when performing risk management and financial analysis. Techniques like Monte Carlo simulations and real options involve certain levels of complexity that few individuals within organizations may be conversant with. These tools are also not easy to use and their interpretation and implementation could be problematic thereby leading to inefficient decisions (Vose, 2008).

Third and lastly, data availability and quality are a medium to a high level of concern in serving as a barrier to integration. Budgeting and risk analysis rely on accurate information hence the necessity to come up with timely data. Nevertheless, in large-scale projects, it becomes easy to come across problems of obtaining informative data from different sources, high quality. Incomplete data or even imprecise data, may make it difficult to properly analyze the financial strategic plans or risk analysis thus paralyzing the integration process (Kerzner, 2018).

Risk management integration and financial analysis as the proper strategy in today's project management are considered in the literature as closely interconnected. Risk management thus explained is a very good way of incorporating risk data in financial models besides adjusting the conventional financial plans according to the risk analyses provided by project managers. This ranges from theoretical tools including the Risk-Based Decision-Making Model and Real Options Theory to practical tools like Monte Carlo simulations and Earned Value Management, which give a sound approach to an integration of risk and financial analysis.

Research has demonstrated that companies which effectively incorporate risk and financial management are likely to have enhanced project performance such as control of cost, resource utilization and enhanced success rates. However, there are limitations, the organization's culture, the complexity of tools, and data access. The greatest key to addressing these challenges will be the need for the development of better risk management and financial analysis instruments and harmony between the two fields.

3. Methodology

This research applies the multiple case study techniques to investigate the practice and application of risk management and financial analysis in project management. All the case studies are derived from construction, IT and infrastructure industries where both risk and finances are important due to uncertainty. The cases are selected in such a way as to

cover a wide range of project size and complexity, as well as the availability of data relevant to the subject and to provide a comprehensive view of how these functions are implemented in practice. Primary data is obtained via a series of post-questionnaire interviews with identified project managers, financial analysts, and risk management professionals from the sample projects. Furthermore, data from the project documentation, risk registers, financial statements, and meeting records are collected to study the interconnection and influence of risk and financial capabilities on projects.

4. Results

The Summary of the case study is highlighted on the Tables 1 & 2:

Table 1 Case Study Summary Table

Case Study ID	Industry	Project Name	Project Type	Risk Management Tools	Financial Analysis Tools	Integration Level (1-5)
1	Construction	Highway Expansion	Infrastructure	Monte Carlo Simulation, Sensitivity Analysis	Cost Estimation, Sensitivity Analysis, Contingency Reserves	5
2	IT	Software Development	Technology	Risk Register, Expert Judgement	Cost Forecasting, Budgeting	3
3	Infrastructure	Railway System	Infrastructure	Monte Carlo Simulation, EVM	EVM, Sensitivity Analysis	4
4	Construction	Bridge Construction	Construction	EVM, Risk Register	Cost Estimation, Budgeting	5
5	Energy	Oil Refinery	Energy	Monte Carlo Simulation, Sensitivity Analysis	Cost Estimation, Forecasting	4

Table 2 Case Study Outcomes Summary Table

Case Study	Key Outcomes	Challenges	Project Outcome (Cost Control, Schedule Adherence, Risk Mitigation)	Project Duration (months)	Budget (in million \$)
1	Improved cost control, accurate budget forecasting, timely completion	Data quality issues, complex tool implementation	Good	24	200
2	Financial overruns, reactive risk management	Lack of integration between departments, delayed financial analysis	Poor	18	25
3	Accurate budget forecasting, proactive risk mitigation	Data accuracy, lack of coordination between teams	Good	36	500
4	Cost overruns, lack of early risk detection	Cultural resistance to change, data accessibility	Fair	30	150

5	Accurate risk assessment and budget allocation, no major delays	Tool complexity, lack of experience in integration tools	Excellent	48	1000
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4.1. Case Study 1: Highway Expansion (Construction Industry)

The Highway Expansion project is one of the large-scale initiatives in the construction industry shown to present an integrated way of managing risks as well as the financial dimensions of the project. Defining pockets of variability, the project relied primarily on two techniques – Monte Carlo simulations and sensitivity analysis – that let the project team analyze the specified risks and estimate their repercussions on work costs and duration. This kind of risk management helped to build up contingency buffers and obtain a more accurate outlook for the company's finances. When it comes to integration level this project achieved S which is equal to 5/5 therefore there was full integration between risk management and financial analysis teams. It was possible to include cost estimates and to provide constant updates and timely changes based on risk evaluation. Therefore, the efficiency became better, more accurate control and budgeting of expenses was achieved, and work on the project was completed promptly. Still, data quality problems and the intricacies of the techniques used to model risk were a concern. With such restrictions, the general results of the entire project can be considered successful in terms of cost, time, and risk management, indicating the expediency of actively applying the principles of integrated risk and financial management in infrastructure projects. The number of months was 24 and the share was \$200 million.

4.2. Case Study 2: Software Development (Information Technology Industry)

In the case of the Software Development project, which belongs to the IT industry, the interrelation between risk management and financial analysis was even more scattered. Risk Registers and Expert Judgement were the main techniques that this project used in the management of risks while cost forecasting and budgeting were the primary funds management tools. However, the authors noted that based on the 'Integration Score of 3/5 which indicated that risk management and financial analysis, among others, were conducted separately, these techniques were used on the project. This absence undermined strategic and efficient financial control by recognizing that the financial plans were often separate from risk appraisal, and that unexpected financial issues emerged. The project had lasted 18 months but it had a comparatively less amount of funding of \$ 2500 lakhs which also had serious problems of delayed and budgetary aspects. Among the threats to the successful completion of a project, the following were highlighted in this case; lack of integration of work across the departments, delay in the generation of the financial analysis that would help in the monitoring of costs, schedules and the proper handling of the risks encountered. From this case, one gets to understand the directions that need to be taken when there is a combination of both the financial and risk teams in IT projects.

4.3. Case Study 3: Railway system (Infrastructure industries)

The Railway System project in the infrastructure sector provided a better implementation of risk management and financial control using tools such as Monte Carlo simulation and Earned Value Management (EVM), for ongoing assessment of both cost and risk. Achieving an integration score of 4 out of 5, this project established remarkable cohesion between financial budgeting and the management of risks. Through the application of sensitivity analysis in the financial planning context of the project it became easier for the project team to develop realistic budgets, make exact adjustments to financial plans in the course of implementation and to be able to forecast for cost increase due to risk factors such as the risk of change in regulations or disruption of the supply chain. The project provided precise budget control and timely identification of the risks with further detailed reporting on such risks. All the same, the project had challenges with the accuracy of data and poor coordination of financial and risk management departments. The project timeline was three years and the total expenditure that has been planned for the project is \$ 500 million. The overall impact was positive, with moderate cost and time performance and good management of risks—a consequence of the appropriate application of financial analysis and risk management techniques but the report could also be enhanced as for the coordination of departments.

4.4. Case Study 4: Building Construction from Construction Industry

Another large construction project in the construction industry called the Bridge Construction project, encountered the problem of cost growth and the inability to identify potential risks in the early stages of work even when using methods such as Earned Value Management (EVM) and Risk Registers for financial and risk analysis. Gaining 5 out of 5 for integration, the staff in risk management and financially integrated well together but failed to perform adequate risk identification and the corresponding risk prevention during the initial stages of the project. As cost estimation and budgeting tools were applied there were some shortcomings in the identification of risks: while labor strikes and

material shortages should have been identified and solved in advance they were not detected and as a result, the budget increased and so did the time of operations. The idea of integrating risk management into the analyses was well established on the theoretical level, but those who comprised the project team encountered many resistances to change and problematic information availability, which contributed to the disruption of organized integrated practices. However, the project was successfully implemented in a total of 30 months and cost \$150 million only. Thus the integration has not fully overcome the problem created by outside conditions. The outcome was categorized as fair in terms of cost control and schedule adherence, underscoring the importance of early and proactive risk management in complex construction projects.

4.5. Case Study 5: Oil Refinery (Energy Industry)

The Oil Refinery project, located within the energy sector, highlighted the excellent integration of risk management and financial analysis. Using tools such as Monte Carlo simulations and sensitivity analysis, the project team was able to assess a wide range of risks—ranging from supply chain disruptions to regulatory changes—and incorporate these assessments into the financial models. This proactive integration allowed for accurate risk assessment, budget allocation, and contingency planning, resulting in a project that adhered closely to both budget and schedule. The project scored 4/5 for integration, indicating a high level of integration between the risk and financial functions, though there were still some minor challenges with tool complexity and lack of experience with advanced integration tools. Nonetheless, the project outcome was excellent in terms of cost control, schedule adherence, and risk mitigation. The project duration was 48 months, with a substantial budget of \$1 billion. The lessons from this case underscore the importance of thorough risk analysis and financial integration, particularly in large, high-risk projects where the financial stakes are high and risk events could have substantial impacts on the project's success.

4.6. Key Takeaways

- Highway Expansion (Case Study 1) demonstrated the benefits of highly integrated risk and financial management, leading to strong cost control, accurate forecasting, and timely project completion. The use of advanced tools like Monte Carlo simulations proved effective in predicting and mitigating risks early on.
- Software Development (Case Study 2), conversely, illustrates the risks of insufficient integration between risk management and financial analysis, where delayed financial assessments and fragmented risk management led to financial overruns and schedule delays.
- Railway System (Case Study 3) showcased a balanced approach with good integration, though challenges related to data accuracy and inter-team coordination persisted, emphasizing the need for better communication between departments for optimal project performance.
- Bridge Construction (Case Study 4) faced difficulties in early risk detection, despite having integrated risk management strategies in place. This highlights the critical importance of not only integrating risk and financial management but also ensuring early identification and proactive management of risks.
- Oil Refinery (Case Study 5) stands out as a model of excellent integration between risk management and financial analysis, with proactive risk identification and mitigation strategies leading to outstanding project outcomes. This case confirms that advanced risk tools and proactive integration can significantly enhance project performance, especially in large-scale, high-budget projects.
- These case studies collectively demonstrate the substantial advantages of integrating risk management with financial analysis in project management, offering valuable lessons for project managers across various industries. While integration improves decision-making, risk mitigation, and financial performance, it is essential to address the challenges of tool complexity, data accuracy, and organizational culture to fully realize the potential benefits.

5. Results and Discussion

The outcomes drawn from the five case studies presented above support much of the current literature on risk management and discounted cash flow valuation in Project Management.

5.1. Integration of Risk management and Financial Analysis

Recent scholars' studies underscore that risk management & schedule HELP: Recent research focuses on the fact that prudent project management, and particularly in large-scale and extremely crucial projects, will increasingly depend on the application of risk management and financial analysis. For example, Marle et al. (2015) conducted a case study using large-scale construction and energy projects, and the result showed that those projects integrating these two functions in the early stages of the project work were more likely to deliver the projects at the right cost and time. This is consistent with the findings from Case Study 1: Within three of the projects undertaken, Highway Expansion and Case

Study 5: Oil Refinery, the level of integration between the risk management and financial strategies was significantly high and it could be seen that the element of financial forecasting; cost control and timely delivery were significantly enhanced.

Similar to the use of Monte Carlo simulations and sensitivity TEST ONE in Case Study 1, Floricel et al. (2014) argue that by utilizing tools such as Monte Carlo simulations, managers are better placed to seize risks that are inherent in future strategic decisions since efficiency means different things to different users and it is hard to predict the future with certainty. Similar tools were used in case study 3, the Railway system, consistent with Kerzner's (2018) argument that risk modelling tools should be integrated to bring enhanced approaches to the project book of account. The integration in these projects has been successful, extortionate on increase thereby supporting Vose's (2008) view that better integration would enhance project performance, especially in industries such as construction and energy, which undertake very expensive projects that may take long periods to complete.

In contrast, Case Study 2: Software Development is somewhat similar to the findings of Zwikael & Ahn where risk management and financial analysis were not given the highest priority and the consequence was a high incidence of cost overruns and delayed projects. The outcomes drawn from the five case studies presented above support much of the current literature on risk management and discounted cash flow valuation in Project Management.

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In Case Study 2 respondents mentioned specific issues of integration for example delayed financial analysis and lack of coordination between departments to avoid financial overruns and reactive risk management, this is in line with Floricel et al. (2014) who noted one of the biggest problems of integration is lack of culture change and silo working in organizations. Some industries especially the IT industry sampled in the study leave risk and financial matters to a few specialists who work independently which hampers quick response to emerging risks and failure to capitalize on potential financial change as and when necessary.

Moreover, the idea observed in Case Study 4 (Bridge Construction) that is associated with the excessive tool complexity for the project to deliver signifies the same notion mentioned by Kerzner (2018) that even simple implementation of sophisticated tools implies the use of particular know-how and experience, for example, in applying the Monte Carlo method. But in relatively small organizations enablement or a relatively inexperienced integrated team, such complexities can hamper the right deployment and usage of these tools hence dampening the overall positive effects of integration on project performance.

The data quality issues in case study one (Highway Expansion) are also closely related to Vose's (2008) observation that incorrect or untimely data can be detrimental to the accuracy of financial forecasting risk assessment and planning. Bad information also poses a problem to financial control because cannot adequately inform cost control decisions when there are cost overruns or delays.

The findings of this study support the findings in the current literature that integrating risk management and financial analysis enhances project performance as evidenced by successful outcomes in Case Study 1 (Highway Expansion), Case Study 3 (Railway System), and Case Study 5 (Oil Refinery). According to Kerzner (2018) and Zwikael & Ahn (2011) project integration management has been found to display better handling of the other project management instruments including cost control, time management and risk management. The projects that were started with coordination between the applied financial strategies and risk evaluations of the projects presented displayed good financial performance, appropriate responses to risks and timely completion of project work, therefore supporting Marle et al., (2015) on a point that recognition of these functions and their proactive integration improves the performance of projects.

Conversely, results were poorer in Case Study 2 (Software Development), where integration was less and are supported by Elkington & Fennell (2012) and Zwikael & Ahn (2011) suggesting that separated financial and risk management in IT projects are likely to cause huge delays and excessive costs. In the Software Development case study, these two domains were not integrated into the implementation, as revealed by difficulties in such studies, particularly in organizations operating in dynamic environments of high uncertainty and frequent shifts in scope or technology.

6. Conclusion

This paper has been an attempt to understand how risk management and financial analysis have been implemented together in project management, and how it affects the project results, about the findings in different industries/fields. This research focuses on identifying the advantages and disadvantages of integrating these two crucial activities through five contextualized cases from the construction, IT infrastructure, and energy industries. The provided case studies show that integration enhances project performance, but this enhancement must be proper coordination between risk and financial management teams, the application of proper tools and techniques, and the consideration of pertinent organizational and data issues.

The observation from three case studies namely; Highway Expansion, Railway System and Oil Refinery case indicate improved cost management and reduction, accurate financial forecasting, enhanced risk management and control, and enhanced project outcomes from proper risk management and financial analysis integration. The success of these projects measured by on-time completion and cost containment, combined with the use of flexible analysis tools such as Monte Carlo simulations and sensitivity analysis, supports the arguments of Kerzner (2018) and Marle et al. (2015) regarding the necessity of effective integration between financial and risk management for complex endeavors.

Conversely, the problems of a lack of integration of risk management practices were demonstrated in Case Study 2 (Software Development) where reactive risk management coupled with unsynchronized financial management practices led to financial overruns and schedule slippage. This result supports Elkington & Fennell (2012) and Zwikael & Ahn (2011) on the dangers of adopting risk management and financial analysis as distinctive tasks, especially in dynamic industries such as IT. Due to the moderate integration seen in this project, there is a desire to highlight the need for earlier involvement of the Risk Management Department in IT projects.

Case Study 4 (Bridge Construction) shows that, though the integration of risk and financial management is appropriate, early identification of risks and their timely management can help avoid such an issue as spending financial resources and time more than is needed. The issues mentioned, namely, cultural resistance, data quality, and tool complexity discussed throughout the case studies especially references to construction and IT sectors suggest that effective coordination between both departments needs to occur during the entire project life cycle.

In sum, the study offers general support to the assessment of both integrated risk and financial management in enhancing the success of projects. This complements current research that has called for better integration and proposes timely information on the techniques, approaches, and other elements that would enable high-risk projects to do so effectively. However, the present work also enlightens regarding the problems related to the integration process such as change management, tools' complexity, and difficulty in data availability.

There is a Macaroz future study to investigate more deeply how the technologies of artificial intelligence and big data help finance and risk management practices integrate more closely. Moreover, further empirical research in a larger variety of industries could deepen the understanding of the processes and help to develop more fine-grained guidelines and instruments for integration.

Consequently, this study advances the existing literature in project management by emphasizing the importance of integrating risk and financial functions to improve project outcomes, minimize risks and uncertainties affecting a project, and aid decision-making throughout the project life cycle.

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