

LEVERAGING PROJECT UNCERTAINTY: A PRACTICAL APPROACH TO THE CONTRIBUTION OF DESIGN THINKING IN COMPLEX PROJECTS

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Abstract

Available literature points out that the complexities of projects have often led to project failure. Insufficient project management standards have led to project uncertainties. The management of project uncertainty lies with the project manager. There is little evidence on empirical literature that is focused on project management and their uncertainty. This paper investigates the practices used by project managers to address project uncertainty and to critically analyze the success of these methods in complex projects by use of design thinking approach in the implementation of projects. The findings of address challenges and concerns facing project managers in managing projects in uncertain environments. This paper will give guide on project design, management, and uncertainty. It will further contribute to the theory on uncertainty on project management.

Keywords: *Uncertainty, Project management, Design thinking*

1. Introduction

Project uncertainty is the ability to predict outcome of parameters or foresee events that may impact the project. Any project is prone to uncertainties. These could range from time uncertainties, financial uncertainties, human resource uncertainties and inherent risks.

The management of projects requires the commitment of the organisation at all stages-design, implementation and monitoring. The organisation must first identify the need to a project. The need for a project is necessitated by a problem facing the organisation or the locals for which the project could be of help. In the same breadth, the organisation must seek the problem for the would-be users and identify what is required from them. The organisation must then assess the needs of the users and come up with the best project proposition for implementation. Participation of project users in terms of views and suggestions is thus an important element in the project design stage. The management of projects is both a challenge and a source of pride for many projects globally. There are complexities in project management that if overcome, would result in desired outcomes. For this reason, project management is critical for all stakeholders of a project. Project management has become a core business process for a large number of companies both at strategic and operational level and this where design thinking contribution comes into practice. We may call a project any activity that is considered significant and necessary and each major project can include a series of sub-projects.

Knowledge of risk and its management is important so as to reduce project failure. Project complexities are ever increasing as the world becomes more dynamic (Marle & Vidal, 2016; Nguyen et al., 2015; Zhang, 2011) and project failures are attributed to mismanagement of projects and miscalculation of project risks (Bosch-Rekvelde et al., 2011). The increasing project complexities and the failure to apply the generally accepted standards in project management has led to the failure of many projects (Flyvbjerg et al., 2003; Kutsch et al., 2011; Harvett, 2013; Qureshi & Kang, 2015). Modern projects may require better project risk management and the improvement of project standards that would match complexities of these projects (Bloom, 2014; Smith & Irwin, 2006) and the management of project risk in the modern operating environment (Ward & Chapman, 2002, 2003). Risk management is an important element in ensuring project success (Davis, 2017). The primary focus of this paper is an understanding of project failure experienced by project managers in relation to the sub optimal application of generally prescribed risk and uncertainty management practices with projects that are highly complex in nature by implementation of design thinking as an approach.

Many innovation projects finish far from their initial estimates and are surrounded by uncertainties. Meyer et al. (2002) noted that risk management aims at identifying and controlling variations in the project. However, complex projects would require a complete shift in project risk management and the application of modern standards to manage project uncertainties. These would shift the focus on reliability, flexibility, and learning of projects. Goffin and Mitchell (2005) corroborate and suggest that dealing with uncertainty is fundamental to innovation management. Projects are seen as a strategic factor in organizations, even though, many projects still fail. Failure of projects could be attributed to managements failure to manage project uncertainties. The latter are however not clearly defined in existing project management literature. Project uncertainty is basically the lack of information and knowledge about project elements. It represents ambiguity of information and lack of information about a project's core elements.

2. Methodology

The methodological approach used was a systematic review of the literature that can be defined as a methodologically rigorous review of research results that aims not just to aggregate all existing evidence but also develop evidence-based guidelines for practitioners

Nowadays an increasing number of projects are being developed in high complexity and uncertainty environment, requiring different approaches for project management: less rigid and more flexible. This paper presents a framework for uncertainties management, through systematic literature review. The existing project uncertainties determine project uncertainties management. Managers of projects should equip themselves with the necessary information on project uncertainties so as to curb project failure.

3. Design Thinking

Design thinking relies heavily on users' needs. This concept was developed by David Kelley and Tim Brown in the late 1990s (Kelley and Littman 2001). Brown (2008) explained that design thinking results in resolving market uncertainties and brings out market value. Therefore, through design thinking, organisations are better equipped to deal with risks that a project may encounter. Design thinking identifies possible project problems, seeks possible solutions to the identified problems, chooses the best solution to problems identified and ultimately implements the solution to solve project problems. Design thinking is incorporated into the innovation process in order to develop specific solutions to address complex issues. Design thinking promotes organisation innovation and provides solutions to address the needs and requirements of organisations. Design thinking employs both technical and theoretical solutions to a problem; uses real life experiences of project users and their suggestions; considers the economic implications of actions through cost benefit analysis and monitors the environmental impact of the project.

Design thinking is advantageous as it aids in alignment of organisation innovation with project goals. Design thinking opens up innovation to include stakeholders. The process creates new distribution channels, innovatively. This enhances customer satisfaction and ensures that the needs of customers are met in time. The process is also responsible for dealing with risks and uncertainties that come with innovation. Through design thinking, organisations can easily manage project uncertainties, without altering the structure and design of a project wholly.

Design thinking being a user centred process, where stakeholders and consumers of the project should be involved in each and every critical process of project management and implementation, the unforeseen circumstances in the project can be addressed through design thinking by involving users in identification of risks and any emerging uncertainty at each and every stage of the project cycle. Design Thinking is nonlinear and dynamic (Scheer, et al, 2011) and follows a process that is: (1) Empathize, (2) Define, (3) Ideate, (4) Prototype and, (5) Test. The process formally resolves organizational problems and gives solutions for the future (Cohen, 2014). Design thinking is thus a step by step process that identifies organizational problems, gives solutions and is flexible to give alternative solutions if project design changes.

Design thinking starts off with the identification of a problem to be solved. At this stage, consultants could be employed to give in-depth understanding of the problem that needs a solution. Design thinking necessitates that project uncertainty can be dealt with by interacting with the physical environment so as to have firsthand information and knowledge of the problem at hand. The stakeholders to a project could be interviewed and their views noted down-this assists in placing the problem and its associated effects on the locals and stakeholders. People's experiences of a certain problem will assist in getting crucial information. This will go a long way in solving the problem.

Define stage involves the gathering of information about an existing problem. This could be done through the interaction and interviews to the people experiencing the problem. The information so gathered will be important in knowing the key features and elements of a problem. The project user's information is well articulated and noted down for management to consider the best alternative to solve a problem. Project managers should thus work hand in hand with the project users in order to get accurate and honest opinions of the problem from the users.

Ideation stage marks the beginning of brainstorming and design thinking. The project management team should get as many ideas and possible solutions to the problems identified. Inherent risks that may arise from the suggested solutions should also be noted and assessed against benefits. Every member of the project team should be tasked with coming up with innovative solutions to problems noted at the earlier stage of design thinking. Possible ways of solving problems arise from the project team as they have the technical and theoretical know how of project management. Their suggestions should be analyzed and costs and benefits weighed.

Prototype stage is experimental phase. Here, the best possible solutions to the problems identified are improved, accepted or rejected. The experiences of the users are important at this stage as they they guide the stage's decision making. This stage is marked by the evaluation, assessment and examination of the possible solutions to problems identified. The implementation of solutions is through prototypes. The inherent risks are also critical at this stage as project failure is curtailed here. Possible constraints to a project are identified and evaluated to avoid any bottlenecks during project implementation.

Test stage is the final stage. However, design thinking being an iterative process means that the results at the test stage are used to refine the problem identified and re-evaluate solutions to the problem. At this stage, alterations are made to assure robust and concrete solutions to problems identified. The product users are critical at this stage as the solutions settled on should be feasible and viable and ultimately solve problems identified at earlier stages of the design thinking process. The involvement of the project users is critical in all stages of project implementation as they are to be part of project monitoring. The latter assures the continuity of the project, even if it's not in the hands of the project managers.

4. Uncertainty and Risk in Complex Project

In order to develop a clear risk management strategy, the risk and uncertainty in project management should be clearly defined (Harvett, 2013; Sanderson, 2012; Walker et al.,2017). Information complexities and probability patterns impact on project uncertainty (James et al., 2006; Kaplow & Weisbach, 2011). Project complexity could be viewed in three main ways: the classical mindset, which looks at the external environment and project objectives; transition, which relates the external and internal elements of a project; and process uncertainty, that suggests that project uncertainty is majorly due to internal project factors or causes (Bloom, 2014; Jauch & Kraft, 1986). Uncertainty consists of ambiguity and volatility as key factors (Song et al., 2017). Ambiguity can be described as the absence of transparent data about external parameters, the uncertainty of cause-effect interactions, and the uncertainty of methods or practices and their perceived impacts. Volatility is defined as the unpredictable impacts or rates at which the environment can produce or change at and is a constant source for uncertainty surrounding unknown or future events (Carson et al., 2006; Song et al., 2017; Walker et al., 2017). Variability is an element of uncertainty (Smithson, 2015; Ward & Chapman, 2003), where variability is the production of a wide range of values for an identifiable parameter. Ambiguity is the unquantifiable measure of uncertainty (Bloom, 2014; Walker et al., 2017). This means that uncertainty brings forth confusion to project implementation. Uncertainty results in time lag and the haphazard use of project resources. In this scenario, the project stakeholders are unaware of the risks that may affect a project. The project managers are thus unaware of the financial requirements of the project.

The project users on the other hand do not associate with the project. This disassociation with the project is not good when it comes to project monitoring because the users will not help in that critical process. The problem in this scenario is that it is not the probability or particular result of an event, but rather the transparency of the event itself. The early stages of projects are often the phases of project life cycle where ambiguity and variability are most easily identified (Atkinson et al., 2006; Harvett, 2013; Pushkarskaya et al., 2015). The importance of considering human epistemological expectations in relation to cognitive decision-making and an individual's perception of the behaviour of the future is essential in the accurate assessment of risk (Liu et al., 2016; Sambasivan et al., 2017). Due to project uncertainties, important elements in the project cycle risk being left out (Bloom, 2014; Sanderson, 2012). This would be result into project failure.

As previously stated, it is highly important to assess human perceptions and reactions when managing for risk and uncertainties in complex projects (Qureshi & Kang, 2015; Zhang, 2011). Design thinking play a critical role in assessing

this human perception through empathy. Although risk is acknowledged to be a result of uncertainty, this does not mean that risk and uncertainty are theoretically synonymous, as risk is “an outcome which can be calculated through measuring probabilities” and uncertainty “concerns the unknown future” (Rutherford, 2002, p. 182). The conclusion arrived at is that there exists a continuum between these concepts which varies in magnitude proportionate to the level of knowledge and calculations (Sanderson, 2012). Risk is the product of events regarded as having known outcomes, while uncertainty exists in events with unknown probabilities and outcomes.

5. Sources of Uncertainty

Rice et al. (2008) identify technical, market, organizational, and resource innovations uncertainties. Technical uncertainties are grouped into four (Shenhar, 2001). These are low, medium, high, and very high. Lechler et al. (2012) assert that even with highly planned projects, uncertainties are bound to arise. Sauser et al. (2009) came up with fifteen authors and the contributions they made to project management. The scholars came up with possible contingent risks and how management could avert them for successful project completion. Project risks cause project contingencies which may hinder the successful completion of any project. Sicotte and Bougault (2008) explained that contingencies could cause the deformation of the original form of a project. The market contingencies could take many forms (Rice et al., 2008). These could be due to change in the tastes and preferences of customers or the emergence of new trends in the market. This could also take the form of changing supplies chain and the pricing model of products suppliers. Additionally, market uncertainties could take the form of the emergence of new competition in the market. New competition has the capability of changing an organization's project course. In designing, planning and execution of a project, project managers must consider the external and internal environment. These have the capability of changing the course of the project for the worse. Proper market analysis and the involving of project users is thus critical. Market uncertainty arises due to the difficulty in understanding the customers' needs and translating them into deliverables to meet customer needs (Biazzo, 2009). Song et al. (2001) highlighted that huge technical uncertainties result to even greater external environment project risks. McCormack and Verganti (2003) explain the relationship between market uncertainty and management modes. The internal environment of an organisation affects its uncertainties. These could be as a result of human resource uncertainties, financial risks and operations uncertainties. Human resources of an organisation may not be stable so as to guarantee the business continuity of the entity-this leads to internal uncertainties. The financial resources of an organisation may not be sufficient to support the firm to continue operating as a going concern. Thus, the firm fails to meet its short term and long-term financial obligations. This results in internal uncertainties. Additionally, the operations uncertainties of an organisation may not be stable to enable the organisation meet its goals and objectives-resulting in internal uncertainties. Lechler et al. (2012) explain these uncertainties in details. Lack of communication, low employee qualifications, unclear delegation of duties (Migilinskas and Ustinovicus, 2008), insufficient management tools (Lechler et al., 2012) are other types of uncertainties. Sicotte and Bougault (2008) grouped these uncertainties into external uncertainty and internal uncertainty.

6. Conclusion

It can be concluded that uncertainty triggers evolution of an organisation. That is why managing uncertainty is one of the core elements in firm's better performance. It is therefore important that the organisation develops procedures and processes to enable it deal with uncertainties. The latter are the challenges which enable design thinking among organizational teams. The management must thus come up with novel ways of dealing with market uncertainties by developing new products. Financial uncertainties could be overcome through prudent use of resources and planning through effective budgeting. Operational uncertainties could be dealt with by drawing up effective plans and organizing tasks with clear lines of reporting, delegation and responsibility.

A project will normally deal with different types of decisions with different type of uncertainty over the planning phase and execution phase. Project objectives must be set out at the initial stages of project planning. Implementation of the project as per the set design would be the next most important aspect of a project. The organisation could then hire project managers to deal with project uncertainties and related risks. The managers need to understand the stage in which the project would require their intervention and anticipate possible problems that could arise and bring about uncertainties. Design thinking would then set in whereby possible solutions to problems identified are brought up to avert project failure. Over time, project management has established efficient framework of dealing with risks as certainties. Since this term is not self-explanatory, it is important to define it in relation to well-defined terms as “risk” and “opportunity”. The key elements in managing uncertainty are design thinking and sense making as enablers of flexibility and rapidness in decision-making regarding the choice of alternative actions in response to the situation. At the same time, standardized and modularized processes and procedures constitute a necessary basis for supporting reflective processes.

Due to fast development of project business, there is a clear need to continuously revise best practices in project design. Uncertainty recognition at project design would help come up with possible solutions that would avert project failure. Some but not all aspects of uncertainty can be categorized and treated as risks, and risk, generally considered as a threat to achievement of project objectives, receives far more overt attention than the broader concept of uncertainty in the traditional view of projects and their management. In conclusion, therefore, uncertainty management is necessary for effective project management. Thus, management of uncertainty must be given great attention by management to ensure effective project management.

Uncertainties have dire effects on projects and project management. Risk management processes that focus on identifying potential events as threats (or opportunities) will not address many important sources of uncertainty. Project management

tends not to address many sources of uncertainty, particularly in the planning and post-delivery stages of the project life cycle. More sophisticated efforts to recognize and manage important sources of residual uncertainty are needed. This intolerance of uncertainty may induce project management behaviours such as cautious/safe ways of working and missed opportunities, the mindless/uncritical/mechanical application of project management principles and techniques, and actions designed to avoid apportionment of blame when things do not turn out as hoped.

Managing stakeholder expectations is a further method of bringing uncertainty into project discussions. While this might mean that some stakeholders are mildly disappointed at the end of a project, this is preferable to having stakeholders being surprised by the final outcome of a project. Managing expectations transfers the uncertainty of surprise into possible disappointment, thus not eliminating the problem, but transferring the nature of the problem to a different more manageable form. The most economic method of compensating for gaps in information is through trust, of which there are many types and levels, each requiring different coping strategies. However, complex projects require the controls of design thinking. The outcome is for a balance of design thinking, with an acceptance that design thinking being a user centered approach all the relevant stakeholders of the project should be involved at each and every stage of the implementation process.

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