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THE RELATIONSHIP BETWEEN DYNAMIC CAPABILITIES AND PROJECT PORTFOLIO RISK MANAGEMENT: THEORITICAL FRAMEWORK

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Abstract

To achieve business success and competitive advantage, attaining project portfolio success plays a vital role for project based companies (Meskendahl, 2010, Killen et al., 2008). This further reflects on the importance of project portfolio management domain which yields project portfolio success within a company (Jiang et al. 2000; Wang et al., 2010; De Reyck et al., 2005; Teller, 2013). One of the components within the project portfolio management domain that is essential to yield project portfolio success is project portfolio risk management (Teller et al.,2013; Olsson, 2008). Consequently, the management of risk is an important objective that needs to be fulfilled for successful project portfolio management. Risk is as an uncertainty which can be both an event or a condition which if occurs causes a negative impact on at least one strategic objective of the project portfolio (PMI, 2008; Chapman et al., 2003). Dynamic capability is a well established strategic management concept that anticipates an uncertainty and has methods to react to it (Garrido et al., 2005). It's also realised as the capacity of a company to purposefully create, extend, or modify its resource base to manage that uncertainty (Helfat, 2007). Therefore, on observing the objective of project portfolio risk management and dynamic capability, there seem to exist an association between the two. However, there is a lack of sufficient theoretical literature establishing the relationship between project portfolio risk management and dynamic capabilities.

This research article aims to establish the relationship between dynamic capabilities and project portfolio risk management. This will be carried out with the help of theoretical analysis of the dynamic capabilities and project portfolio risk management constructs. Finally, this research paper will contribute project portfolio risk management theory providing a relationship chart between dynamic capabilities and project portfolio risk management. This research article will form the platform for future research portraying dynamic capabilities involvement to develop project portfolio risk management empirically.

Key words: *Project portfolio risk management, dynamic capabilities, portfolio management.*
JEL code: M10

Introduction

Companies operate in a highly turbulent environment with changing competitive pressures and customer needs. They need to frequently implement practices that address these arising challenges. These practices include companies resorting to operate using projects and project based activities to create the particular deliverables complying with the cost, time and quality objectives, that construct the company's major strategic competitive factors (Pellegrinelli, 1997; PMI, 2008; PMBOK, 2008). To effectively handle the multiple projects and maximise its value, a system that specialises to allocate resources and maintaining a synergy between the individual projects, becomes critical to the company performance (Blichfeldt et al., 2008; Killen et al.,2008; Teller et al., 2014). This necessity yielded the management of projects in the form of a portfolio (Biedenbach et.al, 2012; Costantino et.al, 2015; Daniel et.al, 2014; Killen et.al, 2010; PMI, 2008).

The term portfolio was primarily introduced into the financial investment domain and it focused on maximising the investment returns by selectively grouping the investments. Consequently, many authors have viewed the portfolios from financial point of view (Archer et

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al., 1999; Caron et al., 2007; Cooper et al., 2001; Kendall et al., 2003; Levine, 2005; Sanchez et al., 2008). However, this concept was incorporated into the project management domain in the form of project portfolio management (PPM) and functions as a collection of individual project, grouped selectively to maximise its value (Costantino et.al, 2015; Daniel et.al, 2014; De Reyck et al., 2005).

One of the most important objectives of the PPM system is its risk management (De Reyck et al., 2005). Within the portfolio scope, two levels of risks can be identified. They are project risks which are represented by the risks arising within the individual projects and portfolio risks that arise due to the interaction between the individual projects within the portfolio (Sanchez et al., 2008, Teller 2013). Multiple authors demonstrated that it is insufficient to address solely the risks within individual projects to fulfil the PPM objectives (Olsson, 2008; Artto et al., 2000, Lee et al., 2009; Teller et al., 2013; Sanchez et al., 2008). A portfolio-wide risk management approach which is regarded to as a combination of project portfolio risk management (PPRM) and project risk management constructs the optimum solution (Kitchenham et al., 1997), as it facilitates the adjustment and reallocation of resources among the projects and allows for the consideration of additional portfolio risks and interdependencies between risks. However, we will exclusively view PPRM, which Sanches et al. (2008) claims is still in its infancy and take into account the portfolio level risks which are uncertainties that form threats to the company.

Dynamic capability is a well established strategic management concept that anticipates an uncertainty and has methods to react to it (Garrido et al., 2005). Therefore, on observing the objective of project portfolio risk management and dynamic capability, there seem to exist an association between the two. The closest associating direct correlation in literature was substantiated by Killen et al. (2008) and relates organisational learning mechanism, a dynamic capability to project portfolio management. But, there is a lack of sufficient theoretical literature establishing the relationship between project portfolio risk management and dynamic capabilities. However, there were rarely any implication associating the various dynamic capabilities constructs and project portfolio risk management and its process.

This research article will mainly focus on substantiating the relationship between project portfolio risk management and dynamic capabilities. Theoretically, this study will make meaningful contributions to the field risk management, project portfolio management and strategic management. Furthermore, a better understanding of portfolio risk management with its main constructs, underlying mechanisms and most importantly, its relationship with dynamic capabilities will be obtained.

1. A literature review on portfolio risk management

1.1. The conception of Project portfolio management (PPM)

A company's PPM system provides a holistic approach to make the right decisions while ensuring the portfolios comprising of the projects and programs are aligned in accordance with the company's strategic objectives (Killen et al., 2008). The first introduction of the concept of the modern portfolio theory was in 1952 by Harry Markowitz and it enabled to determine a specific mix of investments generating highest return on a given amount of risk (De Reyck et al., 2005; Sanchez et al., 2008).

More recently, PPM carries dissimilar comprehension due to a divergent understanding of 'project portfolio' and 'portfolio management' (Milosevic et al., 2006). As a result, using the project management institute (PMI) definitions is appropriate as they are constructed in relation to the PPM objectives and scope. PMI defines a portfolio as: "a collection of projects or

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programs or other work that are grouped together to facilitate effective management of that work to meet strategic business objectives. The projects of programs of the portfolio may not necessarily be interdependent or directly related" (PMI, 2008). This clearly means that in PPM, a company's portfolio is solely a strategic grouping of projects and need not represent an evident relationship between them.

On viewing the obtained definition of PPM and summarising the idea of the authors that contributed to the theory of PPM, there are five main objectives (De Reyck et al., 2005) that are prominent in literature. The following are: (1) Constructing a clear definition for the project portfolio in accordance with the strategic goal that is expected to be achieved. (2) Making specific decisions and compromises on the basis of understanding and accepting circumstances. (3) Identifying and classifying the particular risks involved while trying to eliminate or minimise them. (4) Monitoring the portfolio by assessing its performance on the basis of its progress towards achieving the enlisted goals and objectives. (5) Obtain project portfolio success by establishing confidence in the desire to achieve particular objective (Teller, 2013; Meskendahl, 2010).

This research will view PPM as a central management system that manages individual projects in a portfolio to meet strategic objectives and consequently maximising the returns on each portfolio.

1.2. The conception of Project portfolio risk management (PPRM)

As discussed previously, PPM focuses on aligning projects to the company's strategy. While doing so, the balancing of the risks should necessarily be carried out to fulfil the PPM objectives (PMI, 2008, De Reyck et al.,2005). Risk in accordance with PMI (2008) is defined as an uncertainty which can be both an event or a condition which if occurs causes a positive or negative impact on at least one strategic objective of the project portfolio. This definition illustrates the dual nature of risk revealing that opportunity is a positive implication of risk (Sanchez et al., 2008; Teller et al., 2013; Hillson, 2002; Jaafri, 2001; Olsson, 2008; Ward et al., 2003). Although, it is argued that the opportunity can viewed as a by-product of risk management and not risk itself (Chapman et al. 2003). However, risk refers to the probability of a potential outcome that can be known contrary to uncertainty where the probability of the potential outcomes is unknown (Knight, 2012). The materialisation of the risk can be uncertain, subsequently, in the uncertainty management domain, risk is viewed as an uncertainty (Perminova et al., 2008). So the claims that reflect solely on the characteristics uncertainty cannot be full implied on risk itself (Jaafari, 2001; Ward et al., 2003). To keep clear, the definition of risk within this research, it is considered that risk highlights the negative outcome that can probably materialise and its management either is a necessity to avoid a potential damage or a tool achieve an opportunity.

Within the PPM domain, risk remains to be negative probability that can impact on the objectives of the portfolio (Archer et al., 1999). While managing the risks within the portfolio reduces the failure of the individual projects and more importantly further assist the balancing of the portfolio by eradicating any negative uncertain probability (Caron et al., 2007; PMI, 2008; Perminova et al. 2008). Arguably, the management of individual project risks is sufficient to attain overall portfolio risk management. However, the dependencies between the individual projects may yield new kinds of risk which are beyond the scope of project risk management (PMI, 2008). Consequently, it can no longer be sufficient to address solely the risks of individual projects within a portfolio to maintain the PPM objectives (Olsson, 2008; Artto et al., 2000, Lee et al., 2009; Teller et al., 2013; Sanchez et al., 2008).

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The conceptualisation of PPRM is carried out by few authors as well as represented in the three editions of "The standard of project portfolio management" (PMI, 2013). In the first edition (PMI, 2006a) represented the risk-related criteria while performing the portfolio balancing processes. Further, in the second and third edition (PMI, 2008; PMI, 2013) the elaboration of portfolio risks were carried out by integrating the risk management process within the PPM framework. Caron et al. (2007) used the concept of 'value at risk' for balancing the projects within the portfolio. Olsson (2008) presented a methodology for risk analysis and portrayed the benefits of doing so. Sanchez et al. (2008) introduced a risk opportunity identification framework that decreases the uncertainty of achieving the portfolio's strategic goals. Teller et al. (2013) demonstrates the importance of PPRM and methods to improve risk management quality and its direct relationship with project portfolio success. Some authors have indirectly contributed to the portfolio platform through a program conceptual format. Nevertheless, it has significant relevance in the field of PPRM (Sanchez et al., 2008). Examples of such authors are Lycette et al. (2004) who portrayed the focus of risk management on portfolio strategically by improving the success rate and competitive advantage while Pellegrinelli (1997) proposed benchmarking for competitor analysis to manage the risk associated with that with a program or portfolio. Belingheri et al. (2000) researched on the understanding of risk to assist risk treatment and control. Ray (2000) introduced a knowledge based approach to perform risk planning in cost effective manner. The representation of project risk management can be seen in the guide created by PMI, which is 'Guide to the project management book of knowledge'. There are claims the generic approach can be adapted to every organisational level such as within programs or portfolios (Woods, 2007). Although Cooper et al. (2001) and Miller (2002) quite early on demonstrated the importance of requiring a dedicated risk management construct for PPM because of the missing focus on strategic portfolio objectives demonstrated by project management constructs. Additionally, it is difficult to specify guidelines to analyse the risk from portfolio decision and the manner it affect its strategic goals (Sanchez et al., 2008). This is because the single project management approach helps to identify and manage the risk contradicting the project objectives of time, quality, cost and scope. It rather become necessary to need a specific risk management system because of the difference in objectives of a single project and a portfolio. Although individual project management can be complementary to PPRM as it ensures the management of individual risks within the projects of a portfolio but a dedicated PPRM system will ensure the balancing of projects and program and project success (Teller, 2013; Sanchez et al., 2008).

1.3. The project portfolio risk management process

The objectives of PPRM as discussed in the previous section is to increase the probability and the impact of positive events while reducing or eradicating the impact of negative events (PMI, 2008; Cooper et al., 2001). Risk management is a systematic way of identifying, analysing and dealing with risks which is a potential threat to the company (Chapman, 1997). The PPRM is best represented as a process which is constructed of methods and tools that are required to carry out the various steps in the process. There may be similarities between project risk management process and PPRM process. But, these similarities are only structural and exist because of a risk management process. Although major customisation requirements are necessary owing to the different scope and area of an individual project and a portfolio (Olsson, 2008).

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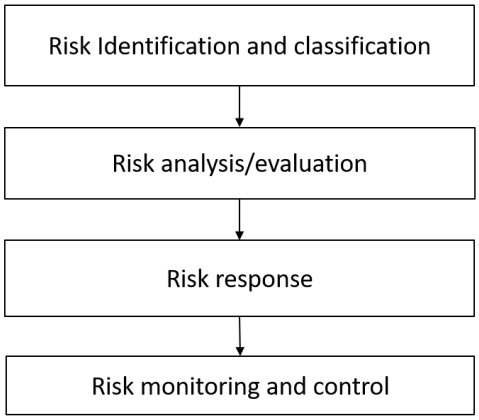

Source: PMI,2008; Chapman, 2001

Figure 5 **Portfolio risk management process**

Figure 1, demonstrates the general process of PPRM. This consists a four step approach portraying (1) risk identification and classification, (2) risk analysis or evaluation, (3) risk response and (4) risk monitoring and control.

Risk identification and classification is one of the most critical activities for portfolio risk management and is essentially considered as a necessary capability (Kwak et al.,2004; Teller et al.,2013;). However, there has been a lack of emphasis on the identification (Chapman, 1997) and classification process which needs to be further addressed. To engage the process of risk identification the two main questions that arise are (1) where to look and (2) how to search for the risk. To wholly satisfy the portfolio risk identification, the structural risks, component risks and overall risks in addition to the individual project risks (Teller et al., 2013; PMBOK, 2008) needs be identified. These become the areas where the risks are looked for. Prior to the portfolio risk identification process, the portfolio itself needs to be well defined. The portfolio definition is represented by its plan and scope (Chapman, 2001). This is quite similar to that of the individual project definition however, the portfolio definition focuses to portray the interdependency within the various projects with distinct characteristics, predetermination of the portfolio variables and overall profitability and growth (Benko et al., 2003). Once the portfolio objectives are clearly defined, the risk areas will assist the PPRM identification to not only view all the potentially risky areas but also can help with cross-referencing not to miss a potential risk (Drake et al. 2006; McFarlan, 1981).

Defining the risk area is quite significant as it would provide the knowledge about the probable area within the portfolio where the risk could be identified. However, it is true that there are specific risks that are associated with different projects (Elkington et al., 2002; Kwak et al., 2005; Tesch et al., 2007), so is the case with portfolios. Nevertheless, the significance of risk area sustains as it eases the risk identification process and also can be used to eliminate chance to avoid identifying a risk. In accordance to prior literature substantiation, the risk areas in technological firms are identified to be organisational/ management risk, culture/ climate risk, strategic alignment risk, projects relationship risk and financial risk (Drake et. al., 2006; Xenidis et.al., 2005; Cervone, 2006; Sanchez et.al., 2009).

To find the particular risk within the portfolio the use of risk identification methods can be used (PMI, 2008). Quantitative research allows the manager to familiarize with the risk related problem or concept to be studied, and perhaps generate hypotheses to be tested.

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Qualitative research is used to gain an understanding of underlying reasons, opinions, and motivations in relation with the portfolio risk. It provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research. Qualitative searching methods are employed for the risk identification (Chapman, 2001; Olsson, 2008).

Risk analysis or evaluation: The risk identification stage portrays the list of potential risks within the portfolio and the further steps in the process is designed to react to the risk. But it would be rather difficult to react to all the risks simultaneously. It may not only increase costs, time and waste resources but also result in inefficient risk management (Akintoye et.al., 1997). This is where the risk analysis or evaluation becomes significant and this is where the interdependencies between the individual project risks are also assessed (Lee et al., 2009).

The risk analysis methodologies present a hierarchy of the risk based on the negative impact and probability of the risk occurrence within the portfolio sphere (PMI, 2008). Subsequently the risks breakdown structure can be established indicating a map able schedule of the individual project portfolio risks (Skec et al., 2012). Many authors have worked on the prioritisation of the risks in project management framework (Kristensen et al., 2004; Cervone, 2006; PMBOK, 2006). Additionally, the use of the probability and impact is functional in prioritising portfolio risks so that relevant risks can be focused (Sanchez et al., 2009; Lyytinen et al., 1997). This is a matrix based model which allows the managers to visualise the risks in accordance with the probability of occurrence and the impact it can have. In these models the risk impacts are distinguished based on some criteria such as mission essential and mission critical and the probability of occurrence (Cervone, 2006). A combination of Lansdowne's (1999) five-point scale of evaluating risk impact and Kendrick's (2003) contributed to the probability context of evaluation allows the manager to prioritise the portfolio risks and create precise schedule. Incorporating qualitative tools such as sensitivity analysis, probabilistic analysis influence diagrams and decision trees (Chapman, 2001; PMBOK, 2006) further consolidate probability and impact matrix.

Risk response is the development of appropriate measures to handle the risks enhancing the company's capacity to manage the risk (Lyytinen et al., 1997) The main objective of the PPRM response system is to make the impact of the risk not affect the objective of the portfolio in a way the balancing of the risks occurs (PMI, 2008). To do so there are certain response strategies which are deployed after the analysis of the risks. Four strategies are widely discussed in literature to act on risks affecting portfolio objectives if they occur. These primary strategies actions are to avoid, transfer, mitigate or diversify the risk (PMI, 2008; Fiet, 1995; Chapman, 2001; Ward, 2003). However, the use of these strategic actions needs to be based on the characteristic of the risk materialisation (Teller, 2013). There are three questions describing this: (1) Is the risk already materialised (ex-post) or will materialise in the future (ex-ante) (Hiriart et al., 2010)? (2) Can the risk be brought under control and is within the company's capability (Miller et al., 2001)? (3) Will the risk be managed either by addressing the source (etiological risk management) of the risk or otherwise (palliative risk management) (Zang, 2007)? The first question points out the proactive nature of risk response. Either it can be deployed after the risk has materialised or before. It has been specified to deploy the risk response regardless the case before or after (Chapman et al., 2003). However, it is of higher convenience if the anticipation of the risk and response unlike the risk repair (Miller et al., 2001). The second question deals with the controllability of the risks. Here it needs to be seen that in case the particular risk is not able to be managed by the company it needs to be still outsourced in a way that the risk response is carried out under a second party responsibility. The third question deals with the manner the risk needs to be tackled at. Either it is the source itself by changing the plan of

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project schedule etc. or it is by deploying further actions to reduce the particular risks (Thun, 2012).

Monitoring and control: The importance of the monitoring and control step is associated with the reviewing risk management process in a manner trying to improve the process simultaneously keeping check on the risks by periodically identifying newly occurring risks and create a response plan for it (Deutsch, 1991). The responsible managers should constantly monitor and communicate risk management results to the stakeholders (De Meyer et al., 2002). A regular review of the risks is supposed to improve the company's ability to respond to the risk because the regular practice prepares the company to foresee the risks and appropriately respond to them (Schon, 1983). The portfolio wide reviewing and reporting allows the portfolio manager to reallocate resources when and where required (Salomo et al.,2007). Moreover, facilitating the transfer of gained experience and transfer of knowledge between project (Perminova et al., 2008). The development of the risk register enhances the company's knowledge gain and lessons learned as a result improves the risk management overall.

To precisely achieve the objective portrayed by PPRM within the PPM domain and further more achieve project portfolio success, there should be an assessable quality which needs to be portrayed by the PPRM (Teller, 2013). The PPRM quality and efficiency criteria dimensions generally tries keep check on the objective of the PPRM process. Teller (2013) demonstrated two dimensions to PPRM quality criteria. They are (1) risk transparency and (2) risk coping capacity.

Risk transparency is meant to enable the manager to solve and clarify certain risk problems as a result of deep understanding of the problem at hand and the manner it could affect the business objective (de Bakker et al.,2010; Lyytinen et al., 1997). The risk transparency is more evident when the information about the risk and risk response methods are well known as a result the management of these risk can occur quickly (McFarlan, 1981; PMI, 2008). This can yield a realistic expectation to estimate the potential risks and the appropriate risk management. Consequently, the portfolio deliverables can be achieved precisely (Raz et al., 2001).

Coping capacity. An increased risk coping capacity enables managers to manage high priority risks as well as low priority risks in a controlled manner. This can positively assist the project portfolio to better balance more profitable projects with higher risks (Teller, 2013). The risk coping capacity reduces the potential impact of risk materialisation and increase the efficiency of the projects in the portfolio. Additionally, controlled risk management allows the manager to focus less on the individual project risks and subsequently allowing focusing on the core strategy of the portfolio (Sanchez et al., 2008).

2. The concept of dynamic capabilities as a resource based view

Companies in the changing environments need to anticipate uncertainty and react to them (Garrido et al., 2005). The ability to systematically and strategically change has been referred to as dynamic capabilities (Teece et al., 1997).

DC was primarily introduced by Gary Hamel in 1989 who demonstrated the multinational strategic re-search leading to Core Competences of the Corporation (Prahalad et al.,1990), although shortly after, in 1995, it was described by Ikujiro Nonaka and Hirotaka Takeuchi in their book on innovation strategy "The Knowledge-Creating Company" (Nonaka et al., 1995). Finally, dynamic capability was referred to as "the capacity of an organization to purposefully create, extend, or modify its resource base" by Helfat (2007). Although in it is explained that the capacity to renew competences so as to achieve congruence with the changing business

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environment is Dynamic Capability too. This involves strategic management in appropriately adapting, integrating, and reconfiguring internal and external organizational drawbacks, resources, and functional competences to match the requirements of the changing environment. In line with Helfat (2007) we use the term „resource" in its broad sense as in (Barney, 1991), and hence it includes activities, capabilities, etc., which allow the firm to generate the rent.

There is some conceptual discussion related to these constituent processes: they are assumed to include both organisational and managerial processes aimed at identifying needs or opportunities for change, and at accomplishing that change to maintain a competitive advantage (Helfat, 2007).

So, essentially looking at resource based view (RBV) in the company's perspective, Daneels (2002) concludes that to understand how a firm evolves over time the dynamic RBV is kind of essential. In this case the firm over time tries to continuously renew and reconfigure itself to survive in the market while deploying its available resources.

Dynamic Capabilities are built rather than being bought in the market (Makadok et al., 2001). They mainly consist of organizational process or routines (Helfat, 2007; Zollo et al., 2002) which were imbibed by the firm over time and consequently used to reconfigure the firm's resource base by removing decaying resources or by recombining old resources with new ones using new methods or ways.

This thereby shows that Dynamic Capabilities are viewed in accordance with the path taken (Dierickx et al., 1989). This path is shaped by the decisions the firm has made in the past and the stock of assets it holds currently (Zollo et al., 2002). Path dependency "not only defines what choices are open to the firm today, but also puts bounds around what its internal repertoire is likely to be in the future" (Helfat et al., 2003). Path dependency could be grounded in knowledge, resources familiar to the firm, or influenced by the social and collective nature of learning (Teece et al, 1997). Learning plays an important role in creation and development of Dynamic Capabilities. Winter (2002) demonstrate that learning is the base of dynamic capabilities and guides their evolution. Learning is also considered as a dynamic capability itself, rather than an antecedent of it. As such, learning as a dynamic capability has been identified as "a process by which repetition and experimentation enable tasks to be performed better and quicker" (Teece et al., 1997). In Zollo & Winter (2002) authors attempted to meld these two positions by explaining that "dynamic capabilities are shaped by the co-evolution of learning mechanisms".

Helfat and Peteraf (2003) emphasise that to qualify as a dynamic capability, the capability not only needs to change the resource base, but it also needs to be embedded in the firm, and ultimately be repeatable. Dynamic capabilities are argued to comprise four main processes: reconfiguration, leveraging, learning and integration (Teece et al., 1997). Reconfiguration refers to the transformation and recombination of assets and resources, e.g., the consolidation of manufacturing resources that often occurs as a result of an acquisition (Ambrosini et al., 2011). Leveraging refers to the replication of a process or system that is operating in one area of a firm into another area, or extending a resource by deploying it into a new domain (Ambrosini et al., 2011), for instance, applying an existing brand to a new set of products. As a dynamic capability, learning allows tasks to be performed more effectively and efficiently, often as an outcome of experimentation, and permits reflection on failure and success. Finally, integration refers to the ability of the firm to integrate and coordinate its assets and resources, resulting in the emergence of a new resource base.

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3. The relationship between dynamic capabilities and project portfolio risk management

The management of risk is an important objective that needs to be fulfilled for successful project portfolio management. It's also realised as the capacity of a company to purposefully create, extend, or modify its resource base to manage that uncertainty (Helfat, 2007). Therefore, on observing the objective of project portfolio risk management and dynamic capability, there seem to exist an association between the two. This section aims to describe the dynamic capabilities constructs and associate its similarity with PPRM process.

Sensing.The capability of sensing is defined as the ability to identify and interpret the opportunities and treats in the environment (Pavlou et al., 2011). Sensing is needed especially when the environment is hard to be predicted (Glaunic et al., 1998). The new opportunities or threats can be sensed through the investment in researches and other activities as the information gathered from these activities may create new knowledge that may well be open for new opportunities. There are many ways in sensing the opportunities and threats such as through research and development (R&D) activities, and competitors', customers', and/or suppliers' actions that may spot or cause the change to happen.

In the sphere of PPRM, it can be realised that identification and the classification highly requires the sensing capability in order to spot the risks and sort them to the appropriate risk area. Additionally, in the monitoring and control discovering of further risks requires the sensing capability. Although, sensing can affect other steps in the process of PPRM there cannot be seen a direct correlation. The other steps reap the benefits of sensing capability as an output of the risk identification and classification step as well as monitoring and control step.

Learning.It mainly signifies the ability to improvise existing operational capabilities with new knowledge. The four main underlying routines of learning capability is acquiring, assimilating, transforming and exploiting knowledge (Zahra et al., 2002). Firstly, acquiring new knowledge relates to developing and obtaining new knowledge (Cohen et al., 1990). Secondly knowledge assimilation is knowledge articulation (Zander et al. 1995) and knowledge brokering (Eisenhardt et al., 2000). Thirdly, transforming knowledge means innovative problem solving (Iansiti et al., 1994), brainstorming (Pisano, 1994) and creating alternative thinking (Henderson et al., 1994). Finally, exploiting knowledge means to puersue new initiatives (Van den Bosch et al., 1999) and improving operational capabilities (Grant, 1996).

The company's learning capability is one of the important and is applicable to all the processes of portfolio risk management. In the identification and classification step, the learning is represented by the understanding new methods to find the risk. As it is common among technological companies to have emerging new unknown risks and complex situations, learning new methods to identify these risks is quite necessary. In the risk analysis and evaluation step its necessary to learn about the risk itself in order to set a priority for it. This not only allows risks of high treat levels not go unnoticed but also allows the company not to overindulge in low level threats and misuse resources. In the risks response step, learning is signified by the understanding of the suitable methods to tackle the risks efficiently. Finally, in the monitoring and control step the experience that is learned from the whole process improves the company's response and trains the managers to foresee potential treats (Schon, 1983).

***Renewal and replication*.** To improve the current capabilities by providing new alternative of capabilities to respond to the crisis. The renewed capabilities are for the same object, majorly or slightly modified and deployed (Helfat et al., 2003). The accurate replication of a portion of a manufacturing process to another plant within a firm provided the basis for subsequent adaptation and renewal of the capability within the recipient plant (Maritan et al.,

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2000). Moreover, completely accurate replication of a capability followed by adaptation to local conditions results in better performance than adaptation prior to attempted replication (Szulanski et al., 2002).

With respect to PPRM, the renewal and replication focuses mainly on the risk identification and classification, risk response and risk monitoring and control. In the identification and classification phase, it is quite important to adapt new identification methods and efficiently replicate it in the future in order to tackle the existence of new unknown treats. The risk response step views the renewal and replication step to apply the newly acquired knowledge in relation to it and immediately putting it to action. Similar is the case with monitoring and control where the new knowledge gained that deals with methods to keep check on the risks are deployed.

Integration.It signifies the ability to combine new knowledge into the new existing capabilities. It contributes collect and combine individual inputs and also builds a shared understanding creating a common ground and new perceptual schema (Weick et al., 1993). The integration highly assists in routinization abilities. It is essential for a company to work as a single unit and sharing of information as well working together improves the overall deliverables and integration capability is responsible for that.

Integration of the portfolio risk management process to the project portfolio management is lacking in many ways (Olsson, 2008; Sanchez et al., 2008). Risk management is highly relied upon to make the appropriate decisions and to do so, it needs to be integrated into the decision making process of the project and portfolios (Dey et al., 2007). Thus it can be portrayed that better integration of the PPRM process into the portfolio management system can improve the PPRM quality and obtain PPM success.

Seizing/ utilization. It takes place after the technologies or markets opportunities have been sensed and identified. Seizing involves decision making in what to invest especially when the domain designs is still not very clear. The firms should seize the opportunities that is solving the customers' problems and when thing getting clear, firms must ready with the right timing to give full commitment to the related resources by grasping the technologies that is most likely to be accepted by the marketplaces. The seizing of particular opportunities can be secured through the commitment and loyalty building of the customers.

Whilst, seizing represents utilising the obtained new knowledge to achieve the particular opportunity, in relation to portfolio risk management this is highly related to the risk response and the monitoring and control steps. In the risk response seizing is of utmost importance because this step of the PPRM process delivers the removal or reduction of the risk impact. This act can also be referred to as an opportunity if in case the threat no longer impacts the portfolio (Ward et al., 2003). While in the case of monitoring it keeps a check seeing no further threats arise and consequently needs to use the new acquired knowledge accordingly.

Coordination.New configurations of operational capabilities require to effectively coordinate tasks and resources and synchronise their activities (Iansiti et al., 1994; Helfat et al., 2003). Moreover, coordination capability is the ability orchestrate and deploy tasks, resources and activities in the with the new operations. Coordination capabilities are namely assigning resources to tasks (Helfat et al., 2003), appointing the right person to the right task (Eisenhardt et al., 1999), identifying the synergies among the tasks (Eisenhardt et al.,2000) and resources and have collective activities (Henderson, 1994).

Coordination capacity is realised in the whole process of portfolio risk management and also essential in the transition between the various steps in the process as a result improving the overall quality of PPRM.

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Reconfiguration.involves recombination and reconfiguration of the firms' assets and organizational structure based on the market opportunities that have been identified and selected. The process of creating alignment of the firms' assets and structures with the changing environments are to create fitness for the sustainability of profit growth. The redeployment and reconfiguration also involves redesigning the business model, and realigning the activities and routines of the firms.

As being able to alter the standard set of risk management process is a necessity as the number of new threats are increasing as a result the reconfiguration capability is quite required for PPRM to increase the overall PPRM quality.

Table 1 portrays the theoretical relationship between project portfolio risk management and summarises the above explanation.

Conclusion

In conclusion, the literature reviews on PPRM and DC was carried out. Furthermore, the relevance of PPRM and DC were carried out followed by their definitions. PPM was defined as a managements system comprising of projects and aligned in accordance with the company strategy. Whilst, PPRM is the risk management system within the portfolio management system and also focuses on the risks arising for the interaction between the projects within the portfolio and not the individual project risks alone. The description of Dynamic Capabilities was presented as the ability of the firm to purposefully create, extend, or modify its resource base in congruence with the changing business environment

Finally, the relationship between PPRM and DC were also theoretically established PPRM needs to be further developed in order to better function and assist portfolio management. Although as a part of integration and customising already existing project management tools into the PPRM framework, in literature, risk management methodologies are sparsely associated with DC within the PPRM domain. Thus, it can be considered that incorporation of DC which is a strategic tool to anticipate the changing environment and systematically change accordingly (Garrido et al., 2005) could vastly contribute to the PPRM domain and improve PPRM quality.

As noted by multiple authors, the challenge of conceptual research is to develop empirical measures. The next possible step for this research is to carry out the empirical study on the demonstrated contents. The proposal to observe the relationship between DC and PPRM should be carried out empirically. Based on the empirical results, further discussion can be made in relation to using DC to develop PPRM.

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	Project portfolio risk management					
Dynamic capabilities		***Risk identification and classification***	***Risk analysis/ evaluation***	***Risk response***	***Risk monitoring and control***	***Portfolio risk management quality***
	Sensing	Sensing capability positively relates to portfolio risk identification and classification.	Not applicable	Not applicable	Sensing capability positively relates to portfolio risk monitoring and control	Not applicable
	Learning	Learning capability positively relates to portfolio risk identification and classification.	Learning capability positively relates to portfolio risk analysis/evaluation.	Learning capability positively relates to portfolio risk response	Learning capability positively relates to portfolio risk monitoring and control.	
	Renewal and replication	Renewal and replication capability positively relates to portfolio risk identification and classification.	Not applicable	Renewal and replication capability positively relates to portfolio risk response.	Renewal and replication capability positively relates to portfolio risk monitoring and control.	
	Seizing/ utilization	Not applicable	Not applicable	Seizing/ utilization capability positively relates to portfolio risk response.	Seizing/ utilization capability positively relates to portfolio risk monitoring and control.	
	Integration	Not applicable				Integration capability complements project portfolio risk management process and positively relates to portfolio risk management quality.
	Co-ordination	Not applicable				Coordination capability complements project portfolio risk management process and positively relates to portfolio risk management quality.
	Reconfiguration	Not applicable				Reconfiguration capability complements project portfolio risk management process and positively relates to portfolio risk management quality.

Table 1 **Relationship between Dynamic Capabilities and Project Portfolio Risk Management**

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Refereces

Ambrosini, V., Bowman.C. & Schoenberg, R. (2011.) Should Acquiring Firms Pursue More Than One Value Creation Strategy? An Empirical Test of Acquisition Performance. *British Journal of Management,* 22(1). 173-85.

Archer, N. P., & Ghasemzadeh, F. (1999). An integrated framework for project portfolio selection. *International Journal of Project Management*, 17(4), 207–216.

Artto, K. A., Kahkonen, K., & Pitkanen, P. (2000). *Unknown soldier revisited: A story of risk management. Helsinki, Finland*: Project Management Association Finland, PMA Finland.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120

Belingheri, M.,Von Eckardstein, D., & Tosellini, R. (2000). Programmatic risk management in space projects. *ESA Bulletin*, 103, 86–91.

Benko, C., & McFarlan, F.W. (2003) Connecting the dots: Aligning project with objectives in unpredictable times, *Boston, MA: Harvard Business School Press*.

Biedenbach, T. & Müller, R. (2012). Absorptive, innovative and adaptive capabilities and their impact on project and project portfolio performance. *International Journal of Project Management* 30. 621–635

Blichfeldt, S.B. & Eskerod, P. (2008). Project portfolio management – There's more to it than

Caron, F., Fumagalli, M., & Rigamonti, A. (2007). Engineering and contracting projects: A value at risk based approach to portfolio balancing. *International Journal of Project Management*, 25, 569–578.

Cervone, H.F. (2006), Project risk management. *OCLC Systems & Services: International digital library perspectives*, 22(4). 256 – 262

Chapman, C. (1997). Project risk analysis and management – PRAM the generic process. *International Journal of Project Management.*15(5). 273-81.

Chapman, C., & Ward, S. (2003). *Project risk management: Processes, techniques and insights* (2nd ed.). Chichester, UK: Wiley.

Cohen, M. A., & Levinthal, D. (1990). Absorptive capacity: A new perspective on learning and innovation. Administrative Science Quarterly, 35(1), 128–152.

Cooper, R. G., Edgett, S. J., & Kleinschmidt, E. J. (2001). Portfolio management for new product development: Results of an industry practices study. *R&D Management*, 31(4), 361-380.

Costantino, F., Gravio, D.G. & Nonino, F. (2015). Project Selection in Project Portfolio Management: An Artificial Neural Network Model Based on Critical Success Factors. *International Journal of Project Management* 33(8).1744-754.

Daneels, E. (2002). The Dynamics of Product Innovation and Firm Competences. *Strategic Management Journal*. 23(12). 1095-121

Daniel, E. M., Ward, M.J., & Franken, A. (2014). A Dynamic Capabilities Perspective of IS Project Portfolio Management. *The Journal of Strategic Information Systems*. 23(2) 95-111.

de Bakker, K., Boonstra, A., & Wortmann, H. (2010). Does risk management contribute to IT project success? A meta-analysis of empirical evidence. *International Journal of Project*

De Meyer, A., Loch, C. H., & Pich, M. T. (2002). Managing project uncertainty: From variation to chaos. *MIT Sloan Management Review*, 43(2), 60–67.

De Reyck, B., Grushka-Cockayne,Y., Lockett, M., Calderini, S. R.,Moura, M., & Sloper, A. (2005). The impact of project portfolio management on information technology projects. *International Journal of Project Management*, 23(7), 524–537.

Deutsch, M. S. (1991). An exploratory analysis relating the software project management process to project success. *IEEE Transactions on Engineering Management*, 38(4), 365–375.

Dey, P. K., Kinch, J., & Ogunlana, S. O. (2007). Managing risk in software development projects: A case study. *Industrial Management & Data Systems*, 107(2), 284–303.

ISSN 2256-0513, e-ISSN 2501-0263

Dierickx, I. & Cool, K. (1989). Asset Stock Accumulation and Sustainability of Competitive Advantage. *Management Science*, 35(12). 1504-511.

Drake, J. R. & Byrd, T. A. (2006) Risk in Information Technology Project Portfolio Management. *Journal of Information Technology Theory and Application*, 8(3). 1-11.

drug discovery. *Industrial and Corporate Change*, 3(3), 607-630.

Eisenhardt, K. M., & Brown, S. (1999). Patching: Restitching business portfolios in dynamic markets. *Harvard Business Review*, 77(1), 72–82.

Eisenhardt, K. M., & Galunic, D. C. (2000). Coevolving: At last, a way to make synergies work. *Harvard Business Review*, 78, 91–101.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: what are they? *Strategic management journal*, 1105-1121.

Elkington, P & Smallman, C. (2002) Managing project risks: a case study from the utilities sector. *International Journal of Project Management.* 20(1). 49-57.

Galunic, D. C., & Rodan, S. (1998). Resource recombinations in the firm: Knowledge structures and the potential for Schumpeterian innovation. *Strategic Management Journal*, 19, 1193-1201.

Garrido, M. J. A., Navarro, R. J., & Camara, B. S. (2005). Strategic capabilities and knowledge transfer within and between organizations — new perspectives form acquisitions, networks, learning and evolution. *Developing dynamic capabilities with IT. In A. Capasso, G. Battista Dagnino, & Lanza. A (Eds.),* 156- 175.

Grant, R. M. (1996). Prospering in DynamicallyCompetitive Environments: Organizational Capability as Knowledge Integration', *Organization Science*, 7(4), 375-387.

Helfat, C. E. & Margaret A. P. (2003). The Dynamic Resource-based View: Capability Lifecycles. *Strategic Management Journal* 24(10), 997-1010.

Helfat, C. E. (2007). Dynamic Capabilities: Understanding Strategic Change in Organizations. *Malden, MA: Blackwell Pub*.

Henderson, R. (1994). The evolution of integrative capability: Innovation in cardiovascular

Hillson, D. (2002). Extending the risk process to manage opportunities. International Journal of Project Management, 20(3), 235–240.

Hiriart,Y.,Martimort, D., & Pouyet, J. (2010). The public management of risk: Separating ex ante and ex post monitors. *Journal of Public Economics*, 94(11–12), 1008–1019.

Iansiti, M., & Clark, K. (1994). Integration and dynamic capability: Evidence from product development in automobiles and mainframe computers. *Industrial and Corporate Change*, 3(3), 557–605.

Jaafari, A. (2001). Management of risks, uncertainties and opportunities on projects: Time for a fundamental shift. *International Journal of Project Management*, 19(2), 89–101.

Jiang J. J., & Klein, G. (1999). Risks to different aspects of system success. *Information and Management*, 36(5), 263–272.

Jiang, J.J., Klein, G., Ellis, T.S. (2002). A measure of software development risk. *Project Management Journal*. 33 (3). 30-41.

Kendall, G., & Rollins, S. (2003). *Advanced project portfolio management and the PMO: Multiplying ROI at warp speed.* Ft. Lauderdale, FL: Ross Publishing Inc.

Killen, P.C. & Hunt, A.R. (2010). Dynamic capability through project portfolio management in service and manufacturing industries. *International Journal of Managing Projects in Business.* 3(1). 157-169.

Killen, P.C., Hunt, A.R., & Kleinschmidt, J.E. (2008). Learning investments and organizational capabilities: Case studies on the development of project portfolio management capabilities. *International Journal of Managing Projects in Business.* 1 (3). 334-351.

Kitchenham, B. & Linkman, S. (1997). Estimates, uncertainty, and risk. *IEEE Software*, 14 (3), 69–74.

Knight, F. H. (2012). Risk, uncertainty and profit. *Courier Corporation*.

Kwak, Y.H. & LaPlace, K.S. (2005) Examining risk tolerance in project-driven organization. *Technovation.* 25(6) 691-695.

ISSN 2256-0513, e-ISSN 2501-0263

Lee, K. C., Lee, N., & Li, H. (2009). A particle swarm optimization-driven cognitive map approach to analysing information systems project risk. *Journal of the American Society for Information Science and Technology*, 60(6), 1208–1221.

Levine, H. A. (2005). *Project portfolio management: A practical guide to selecting projects, managing portfolios, and maximizing benefits*. San Francisco, CA: Jossey-Bass.

Lycett, M., Rassau, A., & Danson, J. (2004). Programme management: A critical review. *International Journal of Project Management*, 22, 289–299.

Lyytinen, K., & Ropponen, J. (1997). Can software risk management improve system development: An exploratory study. *European Journal of Information Systems*, 6(1), 41–50.

Makadok, R. (2001). Toward a Synthesis of the Resource-based and Dynamic-capability Views of Rent Creation. *Strategic Management Journal*, 22(5). 387-401.

Management, 28(5), 493–503.

McFarlan, F.W. (1981). Portfolio approach to information systems. *Harvard Business Review*, 59(5), 142–150.

Meskendahl, S. (2010). The influence of business strategy on project portfolio management and its success -A conceptual framework. *International Journal of Project Management*, 28. 807-817.

Miller, J. (2002). A proven project portfolio management process. *Proceedings of the Project Management Institute Annual Seminars & Symposium*, 347–352.

Miller, R., & Lessard, D. (2001). Understanding and managing risks in large engineering projects. *International Journal of Project Management*, 19(8), 437–443.

Milosevic,D. Z., & Srivannaboon, S. (2006). A theoretical framework for aligning project management with business strategy. Presented at the PMI Research Conference 2006: New Directions in Project Management, Montreal, Canada.

Nonaka, I., Takeuchi, H. (1995) The knowledge-creating company. How Japanese companies create the dynamics of innovation, *Oxford University Press*, Oxford.

Olsson, R. (2007). In search of opportunity management: Is the risk management process enough? *International Journal of Project Management*. 25(8), 745-752.

Olsson, R. (2008). Risk management in a multi-project environment: An approach to manage portfolio risks. *International Journal of Quality & Reliability Management*. 25(1), 60-71.

Pavlou, P.A. & El Sawy, O.A. (2011) Understanding the Elusive Black Box of Dynamic Capabilities. *Journal of the decision sciences institute.* 42(1). 239- 273.

Pellegrinelli, S. (1997). Programme management: Organising project based change. *International Journal of Project Management*, 15, 141–149.

Perminova, O., Gustafsson, M., & Wikström, K. (2008). Defining uncertainty in projects: A new perspective. International Journal of Project Management, 26(1), 73–79.

Pisano, G. P. (1994). Knowledge, integration, and the locus of learning: An empirical analysis of process development. *Strategic Management Journal*, 15, 85-100.

Prahalad, C.K. & Hamel, G. (1990). The Core Competences of the Corporation. *Harvard Business Review.*

Project Management Institute (PMI). (2008a). The standard for portfolio management (2nd ed.). Newtown Square, PA: Author.

Project Management Institute (PMI). (2008b). *A guide to the project management body of knowledge* (PMBOK® guide; 4th ed.). Newtown Square, PA: Author.

Project Management Institute (PMI). (2013). The standard for portfolio management (3rd ed.). Newtown Square, PA: Author.

Ray, P. (2000). An innovative approach of risk planning for space programs. *International Journal of Industrial Ergonomics*, 26(1), 67–74.

Raz, T., Shenhar, A. J., & Dvir, D. (2002). Risk management, project success, and technological uncertainty. *R&D Management.* 32(2), 101–109.

ISSN 2256-0513, e-ISSN 2501-0263

Salomo, S.,Weise, J., & Gemünden, H. G. (2007). NPD planning activities and innovation performance: The mediating role of process management and the moderating effect of product innovativeness. *Journal of Product Innovation Management*, 24(4), 285–302.

Sanchez, H., & Robert, B. (2010). Measuring portfolio strategic performance using key performance indicators. *Project Management Journal*, 41(5), 64–73.

Sanchez, H., Robert, B., & Pellerin, R. (2008). A project portfolio risk-opportunity identification framework. *Project Management Journal*, 39(3). 97–109.

Sanchez, H., Robert, B., Bourgault, M., & Pellerin, R. (2009). Risk management applied to projects, programs, and portfolios. *International Journal of Managing Projects in Business*, 2(1), 14–35.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action.* New York, NY: Basic Books.

Škec, S., Štorga, M., Stankovic, T., & Marjanovic, D. (2012). Mapping risks in product development. *In DS 70: Proceedings of DESIGN 2012, the 12th International Design Conference, Dubrovnik, Croatia*, 311-320.

Szulanski, G., & Winter, S. (2002). Getting it right the second time. *Harvard business review*, 80(1), 62-9.

Teece, D. J., Pisano, G. & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, 18(7). 509-33.

Teller, J. (2013). Portfolio Risk Management and Its Contribution to Project Portfolio Success: An Investigation of Organization, Process, and Culture. *Project Management Journal*. 44(2). 36-51.

Teller, J., & Kock, A. (2013). An empirical investigation on how portfolio risk management influences project portfolio success. *International Journal of Project Management.* 31. 817-829.

Teller, J., Kock, A. & Gemünden, H.G. (2014). Risk Management in Project Portfolios Is More Than Managing Project Risks: A Contingency Perspective on Risk Management. *Project Management Journal*. 45(4). 67-80.

Tesch. D., Kloppenborg, T.J. & Frolick, M.N. (2007) It Project Risk Factors: The Project Management Professionals Perspective. *Journal of Computer Information Systems*. 47(4). 61-69.

Thun, J.-H., & Hoenig, D. (2011). An empirical analysis of supply chain risk management in the German automotive industry. *International Journal of Production Economics*, 131(1), 242–249.

Van den Bosch, F., Volberda, H., & De Boer, M. (1999) Coevolution of firm absorptive capacity and knowledge environment: Organizational forms and combinative capabilities. *Organization Science*, 10, 551-568.

Wang, J., Lin,W., & Huang,Y.-H. (2010). A performance-oriented risk management framework for innovative R&D projects. *Technovation*, 30(11–12), 601–611.

Ward, S., & Chapman, C. (2003). Transforming project risk management into project uncertainty management. International Journal of Project Management, 21(2), 97–105.

Weick, K. E., & Roberts, K. H. (1993). Collective mind in organizations: Heedful interrelating on flight decks. *Administrative Science Quarterly*, 38(3), 357- 381.

Woods, M. (2007). Linking risk management to strategic controls: A case study of Tesco plc. *International Journal of Risk Assessment and Management*, 7, 1074–1088.

Xenidis, Y. &Angelides, D. (2005) The financial risks in build-operate-transfer projects. *Construction Management and Economics*. 23(4). 431-441.

Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. Academy of Management Review, 27(2), 185–203.

Zander, U., & Kogut, B. (1995). Knowledge and the speed of transfer and imitation of organizational capabilities. *Organization Science*, 6, 76-92.

Zollo, M. & Winter, S.G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, 13(3), 339-51.