A Contingent Model of Project Organization and Management

Research-in-Progress

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ABSTRACT

There is a presumption in project management research and practice that project management follows a “one size fits all” model. This is manifested in the introduction of many prescriptive models by project management bodies such as the Project Management Institute and the Association of Project Management, to name a few. These generic models steer away from the differences across projects and focus only on the common aspects of projects. However, in many circumstances, the generic nature of such models renders them poorly equipped to deal with the challenges of organizing and managing complex projects. In this paper we present a contingent model that has the potential to deal with environmental variability and constraints. This model is based on two contingent factors: location of work and project complexity. It develops four types of projects based on two contingent dimensions and proposes a few related hypotheses.

Keywords


INTRODUCTION

Instead of classifying projects by the industry they belong to, the contingent approach assembles projects in classes based on particular project context factors referred to as contingent factors. Each class (type) includes a number of projects that come from different industries, yet all have one or more common organizational characteristic. The contingent approach was proposed by several authors (Hanisch and Wald, 2011; Shenhar and Dvir, 2007; Turner, Huemann, Anbari and Bredillet, 2010). Geographical location and dispersion of project work is one critical aspect that was pointed out in some of these works (Turner et al., 2010). However, this was not systematically addressed in the context of a contingent approach to project organization and management. In addition, there is a lack of empirical research dealing with geographical location and related concerns as key contingency variables in project management. This research aims to develop and test a contingent model that is based on two contingent factors: location of work and project complexity. The argument is that the fit between the organization of project resources (human and non-human resources) is mediated by the dispersion and co-location of the project’s members and tasks, as well as the levels of project complexity, as they impact on project performance. The appropriate organization of project’s human and technological resources is an essential step in project planning. Project managers face difficulties in deciding on the selection and organization of people, as well as the amount of investment in technology for their projects. Thus, the ability to understand the effects of these contingent influences can aid project managers to achieve greater agility and effectiveness in managing projects. We develop a set of related hypotheses. The next step of this research is to empirically test the model and the hypotheses.

LITERATURE REVIEW

Twentieth century witnessed the evolution of classical organization theory through the contribution of three main theories: Taylor’s scientific management theory, Mooney and Reiley’s administrative theory and Weber’s bureaucratic theory (Daft, Murphy and Willmott, 2010). Classical organization theory was characterized by its mechanistic structure. Its overly rigid conceptualization of organizations triggered the neoclassical organization theory, which reacted against the classical theory to direct its concerns to the human needs. However, both theories (classical and neoclassical organization theories) followed a
universalist approach that tends to apply one set of principles to all organizations. An unfortunate consequence of the universalist approach was the tendency to underplay the differences among organizations. Contingency theory attempted to address the critical variations as they impact performance. The idea was that there is no “one size fits all” and that effectiveness is achieved through considering the circumstances organizations encounter. The dominant models in project management emphasize the planning and control dimensions (Howell, Windahl and Seidel, 2010; Winter, Smith, Morris and Cicmil, 2006). These models follow rational, universal and deterministic approach (Söderlund, 2004). Other models investigated different aspects of project management and organization such as behavioral (Crawford and Pollack, 2004; Söderlund, 2004; Turner et al., 2010), technological, and environmental perspectives (Hanisch and Wald, 2011; Shenhar and Dvir, 2007).

**Contingency Theory**

The contingency approach is in the midst of two extreme views; a universalistic organization and management approach and an every-case-is different approach (Birkinshaw, Nobel and Ridderstråle, 2002; Kast and Rosenzweig, 1973; Schoonhoven, 1981; Zeithaml, Varadarajan and Zeithaml, 1988). It argues that a middle ground exists to identify common recurring settings and observe and establish how structures and behavioral processes perform in these specific settings.

The contingency approach assumes that there is more than one way to achieve effectiveness in organizations. Each way has varying effectiveness under all situations, where one way can be more appropriate for a certain situation than another (Kast and Rosenzweig, 1973; Zeithaml et al., 1988). Thus, the appropriate match of contingency factors with structural factors (ways) will allow for better response to the environment and achieve higher levels of effectiveness (Lawrence and Lorsch, 1969).

Organizational contingency theory involves three variable types: Contingency/Context Variables, Structure/Organization Variables, and Performance/Criterion Variables (Umanath, 2003). Theorists have identified a number of contingency variables such as environmental complexity (Burns and Stalker, 1961; Lawrence and Lorsch, 1969), organizational strategy (Chandler, 1962; Child, 1972; Hofer, 1975), technology (Thompson, 1967; Woodward, 1965) and organization size (Hickson, Pugh and Pheysey, 1969), to name a few.

In the contingency fit theme, the relationship is extended to include a conditional association of independent variables with dependent variables (Umanath, 2003). Contingency theory assumes that the better is the match or fit between the independent variables, the better their effect on the dependent variable. The focus of contingency theory follows the same focus of organizational theory; which to explain an organization’s success or failure. Success or effectiveness means being able to achieve defined goals such as efficiency, profitability, employee satisfaction, and/or higher innovation rate. Furthermore, effectiveness can be attained through being able to function well as a system and being able to satisfy the stakeholders (Donaldson, 2001).

Contingency theory rests on the ‘fit’ effect. This effect has to be confirmed empirically through establishing that the fit of structure to contingency affects performance positively and the misfit of structure to contingency affects performance negatively (Woodward, 1965).

**Approaches and Models in Project Management**

The typical life span of organizations tends to be longer than that of most projects. Projects are one form of transitory organizational setting that undertakes time-bound, well-defined tasks to create a unique product or service (Association for Project Management, 2006; Lundin and Söderholm, 1995; Project Management Institute, 2004; Söderlund, 2004). Despite the growing diversity of projects, researchers and professional bodies in project management also proposed models of project organization and management from a “one size fits all” perspective. Although they recognized the wide variations across projects, they generally continued to follow the classical organization theory assumption that projects can be managed with the same or similar explanatory models, methods, and tools (Turner et al., 2010).

Emerging from the field of operations research, project management in the early years was characterized by a set of optimization tools and techniques that are used to plan and control project delivery such as Gantt charts and Critical Path Analysis (CPA). These tools used mathematical modeling techniques to optimize the duration of projects, its associated costs and production scheduling. These are also called “hard” systems models (Crawford and Pollack, 2004; Turner et al., 2010). This approach followed the Taylorian school, which tended to view the project in mechanistic terms. This approach is insufficient to model project organization and management, because it lacked specificity and relevance in certain environments. In addition, the optimization approach lacked the ability to include behavioral aspects and quality management, because it dealt with quantitative and not with the key qualitative aspects. Optimization models are limited to
being low level modeling tools. They do not provide higher conceptual level modeling of project management components and their relationships. Furthermore, they only provide tools that help in optimizing the triple constraints (time, cost and quality). Project success is not dependent on these constraints only. Shenhar and Dvir (2007) argued that achieving business goals and satisfying key stakeholders are more important criteria for project success.

The optimization approach follows the path of standardizing project management practices by eliminating variation of implementing these practices. The standardizing practice is achieved by establishing predictable and repeatable processes, which attempt to minimize the variances among project management practices. The standardization approach seeks to standardize the practices of project structuring (i.e. process, organization, and information technology), project management systems (i.e. tools, techniques and metrics), and project culture and leadership (Milosevic, Inman and And, 2001). These limitations led project management researchers to investigate better approaches that consider key behavioral and environmental sources of variation as dimensions in the modeling of project organization and management.

**Application of Contingency Approach in Project Management**

The application of a contingent approach in project management can be divided into two approaches: practitioner approach and research-based approach.

The practitioner’s approach relied more on models that aim to standardize project management practices and optimize planning and control factors. Although these models often discuss the behavioral and environmental aspects and recognize the differences between projects, their discussion is generic, and aimed to define the topics more than showing explicitly how these aspects relate to each other. This approach is exemplified in project management professional associations, also known as “Bodies of Knowledge” (e.g. Project Management Institute (2004) and Association of Project Management (2006)). These frameworks provided overviews of the topics to guide practitioners in planning and managing a project through its life cycle.

The research-based approach is more based on theoretical concepts of project management. The aim of frameworks developed under this approach is to achieve fit between the project conditions and organization characteristics (Howell et al., 2010). Therefore the focus is on studying more parameters related to the project environment. This approach was supported by empirical work, mostly case studies (Crawford and Pollack, 2004; Shenhar and Dvir, 2007; Turner et al., 2010). This approach is relatively narrow and is not capable of including a full range of projects (Howell et al., 2010). It is widely recognized that further quantitative investigations need to be undertaken.

Several frameworks have been proposed in the literature based on the contingent approach. Hanisch and Wald (2011) presented several influencing factors on project management. They introduced potential research areas around three fundamental dimensions of contingency theory (design, context and goal). The framework aimed to contribute to project management research by incorporating literature from different disciplines. The framework needs to be tested empirically by developing measures and testing relevant hypotheses. Project categorization attempts were introduced in the frameworks of Crawford and Pollack (2004), Shenhar and Dvir (2007) and van Donk and Mollay (2008). However, some were not exhaustive enough to include all emerging project types such as the virtual project (Shenhar and Dvir, 2007; van Donk and Molloy, 2008). Shenhar and Dvir (2007) proposed a graphical tool, so called the Diamond model, which aimed to: (a) permit project managers to distinguish the type of their project; (b) analyze the fit between an actual style of project management and a required one; and (c) identify project associated risks and benefits. Crawford and Pollack (2004) used a numerical scale which allows project managers to categorize projects by interpreting its types in terms of the hard and soft characteristics. The framework focused on the project’s internal environment and did not consider much of the external environment. Söderlund (2004) extended projects management further to include recent trends by addressing reasons for the existence of project organizations and their differences, modality of project organization, and factors that determine project organizations success. Turner and his colleagues (2010) concur with Söderlund (2004) about the insufficiency of optimization tools to represent a methodology of project management. They stressed that projects differ from an organization’s routine operations and their success depends, additionally, on how well risks, integration and urgency are managed. Their contingency perspective stressed on the importance of understanding the differences between projects. Geographical location of projects was addressed as an attribute to categorize projects. The framework did not explain how this attribute affects the project organization and performance as a contingency factor.

**A CONTINGENT MODEL BASED ON LOCATION OF WORK AND PROJECT COMPLEXITY**

The proposed contingent model consists of three main project elements: *project context*, *project organization*, and *project performance*. It simply postulates that, in a certain way, *project context* and *project organization* must fit together to facilitate *project performance* (Umanath, 2003). It directs the attention to the effect of the immediate surrounding environment of projects on organizing resources to achieve better performance. The *project context* element consists of two dimensions:
location of work and project complexity. These dimensions (continuums) together form a two-dimension project organization that divides projects into four types (Type 1, Type 2, Type 3, and Type 4). Each type depicted as a quadrant (See Figure 1). Each quadrant suggests that when a project’s location of work and complexity are at certain degrees, its structural and technological characteristics are manipulated to a certain level that results in a successful project performance. These characteristics are referred to as project organization in our model. Project organization practice requires the management of project resources (human and non-human) (Rad, 2003). The model nominates team structure and use of Information and Communication Technology (ICT) as the most important characteristics that project managers need to consider in organizing resources in different contexts.

The decision making in typical hierarchical structures is, usually, centralized in the most top positions, and the information flow tends to be vertical. These types of structures are typical in stable environments (Mintzberg, 1979). Decisions are delegated to lower positions as the complexity of the environment grows, because the top positions become distanced from the ‘sharp-end’ action positions (at the bottom) and cannot understand arising problems or opportunities (Johnson, Scholes and Whittington, 2005; Mintzberg, 1979; van Donck and Molloy, 2008). The more empowerment given to people in such a structure, the more decentralized and flat the structure becomes.

The proper use of ICT can offer synergies with other organizational variables to help achieve goals (Drury and Farhoomand, 1999; Mukhopadhyay, Rajiv and Srinivasan, 1997). ICT use contributes to projects by providing better reliability, greater efficiency, consistency and accuracy (Nielsen, 1998). ICT use is defined in this model as a technology that facilitates the performing of tasks, sharing of information, and facilitation of communication among project members.

![Figure 1. A two-dimension project organization](image)

**Location of Work:**

The first dimension is the location of work. It represents a continuum of the geographical distribution of projects’ members and tasks. At its lower end a project is called co-located; which means that both the team members and tasks are located in one physical place. At the upper end, the project is called dispersed; which means that majority of members and parts of tasks are distributed in two or more geographical sites.

The geographical location of work is one of the contingent factors that can influence the project’s structure, and eventually its performance. By many project managers, co-existence of team members in one location to perform tasks is considered as the ideal situation because of many benefits (Carmel, 1999). However, there are many cases where project tasks have to be performed from different remote locations (e.g. global software development projects).
Co-location is the physical proximity of individuals working on a particular task or product; being within easy walking distances such as being down the corridor, next floor or in a nearby building (Allen, 1977; Carmel, 1999; Rafii, 1995). Tasks are performed in the same place as well. Co-location and face-to-face interaction in the development of any product, provides some benefits. Galbraith (1995) confirms, in designing organizations, that co-location increases communication because physical distance hurdles are eliminated. The increased communication speeds up projects and reduces projects’ timelines because communication lines are short and feedback is given quickly (Rafii, 1995). Moreover, increased interaction can reduce miscommunication and increase trust, Rafii stresses. Other benefits could be the efficient use of resources and reduction of project costs because fewer support services are needed to support co-located rather than dispersed. Agile methods, such as Scrum and eXtreme Programming, are two practical examples of enabling team efficacy through face-to-face interaction (Hoda, Kruchten, Noble and Marshall, 2010).

The opposite end of co-location is the dispersed location of work when some or most of the project’s members or tasks are geographically distributed. Organizations distribute development processes across different areas to gain reduction in development costs, access to specialized designers and developers, around-the-clock operation and/or proximity to customers (Carmel, 1999; Helen and Nahar, 2011). Rafii (1995) argues that for many projects, co-location is often not feasible due to the globalization of product development. As introduced in O’Leary and Cummings’s (2007) multi-dimensional conception, geographic dispersion has three facets: spatial, temporal and configurational. Spatial dispersion is referred to the geographic distance between individuals, which reduces spontaneous communication (i.e. face-to-face interaction). Temporal dispersion is referred to the time difference between individuals. The asynchronous interaction caused by these temporal differences inhibits rich interaction in solving problems (Herbsleb, Mockus, Finholt and Grinter, 2000). Configurational dispersion is referred to the number of sites that the work takes place in and the distribution of members (evenly or unevenly) between sites. Configurational dispersion increases the number of dependencies, which increases coordination complexity. In agile project management practice, dispersed location of work is inconsistent with one of the Agile Manifesto’s fundamental principles - the necessity of co-location for team efficacy (Fowler and Highsmith, 2001). This has given rise to suggestions for modifying agile methods to conform with distributed settings (Agerfalk and Fitzgerald, 2006; Holmstrom, Fitzgerald, Agerfalk and Conchuir, 2006).

Co-location and dispersion in projects can be viewed as similar to the classic organizational continuum of centralization and decentralization (Carmel, 1999). On one extreme, team members and tasks are concentrated at a single point in co-located projects. While on the other extreme, members and tasks are distributed on different points in dispersed projects. It is not unusual to consider the decision power to be centralized in co-located projects and decentralized in dispersed projects. Project managers are challenged to find the right balance between central control and local autonomy (Bryde, 2003). They are also challenged to balance the amount of ICT utilization in a project. Project environment, whether co-located or dispersed, contribute in determining this balance. On one hand, centralization works better in co-located environments, where the manager can have a physical, face-to-face contact with the project’s team, which allows easier observation and informal discussions. Therefore, with a complete knowledge of the work in such a case, a manager can give spontaneous confident decisions or advices. On the other hand, when the work tasks and/or the team members are dispersed across different sites or countries, a project manager faces lack of some necessary information and knowledge about tasks on remote sites. This affects his/her ability to make accurate decisions. Therefore, decentralization works better in these situations, where the decision making power is delegated to remote sites. Considering the location of work dimension, dispersed projects, should direct more of its technology spending in communication and collaboration technologies. This will enhance team members connectivity and reduce dispersion obstacles (Davis and Khazanchi, 2007).

Project Complexity:

Second dimension is project complexity. Complexity is “the state or quality of being intricate or complicated”, according to the online Oxford Dictionaries (2010). Project complexity is also referred to the nature and amount of subtasks and their interaction (Tatikonda and Rosenthal, 2000). In a descriptive framework introduced by Geraldi and his colleagues (2011), they defined complexity in five dimensions: structural, uncertainty, dynamics, pace and socio-political. These dimensions are interdependent and could exist as a mixture in some projects. Another definition of complexity is the use of system and subsystem levels (Shenhar and Dvir, 2007), where low complex projects are viewed as subsystems of other higher system levels. Complications stem from different sources such as the details of project’s tasks, ambiguity of events and causality, inability to pre-evaluate actions (uncertainty), unpredictability of future events or outcome, rapid rate of change, and social structure (Argote, Turner and Fichman, 1989; Hass, 2009).

Complexity encompasses many aspects related to projects. We direct the attention to some aspects that will form a working definition to serve the purpose of the proposed model. Project complexity is reflected in uncertainty challenges such as difficulty to define, understand or perform tasks. In addition, the unpredictability of the solution or end product of the project...
We categorize project complexity degree by its uncertainty and unpredictability. The complexity continuum suggests that low complexity projects are those which have clear, easy to define, and easy to pre-evaluate tasks. It also suggests that these projects have low rate of task change and predictable outcome. High complexity projects are those which are unclear, difficult to define, and difficult to pre-evaluate. They also have high rate of task change and unpredictable outcome.

Project Performance:

Project performance is deemed to be the result of the influence of context factors on the project’s organization design (Hanisch and Wald, 2011; Umanath, 2003). The model describes four resulting types of project organizations based on the dimensions of location of work and complexity. Previous research that attempted to study effective organization structures for successful performance showed that, low complexity is associated with increased centralization, whereas high complexity tasks are associated with decentralized structures (Ahuja and Carley, 1998; Argote et al., 1989; Johnson et al., 2005; Mintzberg, 1979; Rulke and Galaskiewicz, 2000; van Donk and Molloy, 2008). This is demonstrated in the centralized structure of Type 1 projects and the decentralized structures of Type 3 and 4 projects in this model. However, in dispersed environments low complexity projects require more delegation of power to lower positions, which results in a relatively decentralized structure (Type 2).

Positive association between ICT use with the performance was evidenced in Aral et al. (2006). This study found support for a strong association between ICT use and worker productivity. At the communication level, ICT use was deemed as a key success factor for virtual group communication because it keeps members connected by distributing information among them (Davis and Khazanchi, 2007). Generally, the lower the complexity of tasks the more the project managers tend to manage it using conventional project management approaches and task execution methods, that do not depend on electronic technologies (Hass, 2009; van Donk and Molloy, 2008). Therefore, ICT use for task related work in co-located projects is limited (Type 1 and 2). However, ICT can facilitate other, relatively, low administrative tasks such as program and meeting scheduling and record keeping. In dispersed environments the role of technology could extend to facilitate communication needs due to the lack of face-to-face contact (Type 2 and 3). High complexity projects tend to have high level of ICT use in both co-located and dispersed environments (Type 3 and 4). This is because information technology’s processing power helps team members to perform difficult and very sophisticated tasks in a fraction of a second. Furthermore, collaboration tools enable distributed groups of people to access and contribute to tasks or part of it. Therefore, we presume that complex tasks require a mediating technology that enables the performing of sophisticated tasks and at the same time enables other dispersed team members to contribute to that task remotely (Type 3). Next we demonstrate some describing examples:

- **Type 1**: A construction project could be an example of type 1 projects. Recall our project complexity continuum, the task of constructing a building is clear and can be defined and evaluated in terms of cost, time, specifications and construction techniques. Once the building drawings are approved and construction is started, changes to the task are low, and they continue to lower the more progress is made. The final built building (outcome of the project) is predictable and known from the beginning of the project (i.e. its dimensions, shape, color, etc.). Since the work is performed on one physical site (e.g. a building on a land of 500 m²), communication between project manager, supervisors and workers is mostly made face-to-face. This suggests that project manager’s knowledge of the work and its related problems is more, which results in more confidence to take accurate decisions on his own. And since physical contact exists, not much use of communication technologies is required. Such construction projects tend to have a centralized structure; with decision concentrated on the project manager position.

- **Type 2**: Many auditing projects carried out in large organizations falls under this type. It usually involves working between different locations (audit organization, multiple locations within the client organization and client warehouses). The complexity of the audit task is considered to be low because it is clearly defined in terms of its process and outcomes. Auditors follow specific procedures of collecting information and evidences. They also conclude with a set of pre-designed reports as an outcome of the audit process. Since auditors work between various sites they need to take decisions based on their own observation and judgment (i.e. judging a process or physical condition of an asset), they are usually autonomous in such decisions. Although auditors use some diagnostic software to test the validity of their client’s accounting systems, most of their work is done through examining physical documents and objects, thus, their use of technology is considered low.

- **Type 3**: Global software development projects are good examples of this type. Developing software globally requires having parts of the software done on remote sites and developers work from different locations. These projects are deemed to be complex because of the high unpredictability of the final output product. It is not easy to define the tasks especially when requirements are gathered from different users. It is also difficult to pre-evaluate the
amount of coding required. Project manager’s supervision and knowledge of team members and their tasks is less due to physical distance, which necessitate delegating decisions to subordinates and give them more autonomy. ICT use in Software development is high because software development relies on technology to exist in the first place. Furthermore, technology plays the enabling role in coordination and communication due to the dispersed and complex nature of this type of projects (Carmel, 1999).

- **Type 4**: Aerospace projects, is an example of such type. These projects are very complex in nature where uncertainty and unpredictability are implicit in its technology, functionality and outcomes. Aerospace project activities are typically carried out with relatively steady planned time-critical-schedules, and in a single site (i.e. a base or lab). Team members’ autonomy is important to allow for making decisions related to complex problems. High uncertainty, unpredictability and autonomy dictate a decentralized organization of its structure. Technology is highly used to reduce complexity, especially in enabling or facilitating task performance.

It is essential to note here that the project types used in this model do not represent industries. Some projects may come from the same industry but may fall in different project type, which is due to the different complexity levels. For instance, a software development project may fall in Type 3 quadrant, but another software development project may fall in Type 2 or 4, it is dependent on how its tasks and people are distributed, in addition to how complex its task is.

**RESEARCH IN PROGRESS:**

Based on the model developed in this research, we propose the following four hypotheses (Table 1). The empirical segment of this research is currently in progress. Using survey methodology, we have collected data on team structure, ICT use, commitment to quality, and project performance for two sets of sample projects; one set is from construction projects, which represents Type1 projects and the other set from global software development projects, which represents Type 3 projects.

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<thead>
<tr>
<th>Hypothesis</th>
<th>Project type</th>
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<tr>
<td><strong>H1</strong>: Low complexity projects operating in a geographically co-located environment tend to have a high level of centralization in its structure and use low level of ICT.</td>
<td>Type 1</td>
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<tr>
<td><strong>H2</strong>: Low complexity projects operating in distributed geographical locations tend to have low levels of both centralization and ICT use.</td>
<td>Type 2</td>
</tr>
<tr>
<td><strong>H3</strong>: High complexity projects operating in distributed geographical locations tend to have low level of centralization and high use of ICT.</td>
<td>Type 3</td>
</tr>
<tr>
<td><strong>H4</strong>: Projects operating in a geographically co-located space and are high in task complexity tend to have low level of centralization and high level of ICT use.</td>
<td>Type 4</td>
</tr>
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</table>

**Table 1. Research Hypotheses**

**REFERENCES**


