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Full Paper

DYNAMIC CAPABILITIES FOR CONSTRUCTION CONTRACTORS

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ABSTRACT

The highly competitive, fragmented and volatile nature of the construction industry has resulted in a number of challenges for construction contractors. Project management capabilities that have evolved in the construction industry over the past few decades, if properly implemented, could effectively address each of these challenges. The project management capabilities identified at project, program, portfolio and enterprise levels include Project Delivery Capability, Benefit Realization Capability, Project Selection & Prioritization Capability, Resource Allocation Capability, Alliance Management Capability and Cross-project Learning Capability. This paper contends that project management capabilities form the core of dynamic capabilities required by construction contractors to effectively compete in this industry. Underpinning dynamic capability is an organizational learning process that continuously strives to improve and adapt its operating routines and processes.

Keywords: Program Management, Construction Contractor, Portfolio Management, Project Management, Dynamic Capability, Project Delivery.

INTRODUCTION

The construction industry is highly competitive, diversified and disaggregated. It requires a unique combination of labour and material inputs, on-site coordination and a large number of specialized trades (Eccles 1981). Work is typically organised into small and often isolated packages that are performed by predominantly small and medium enterprises offering a narrow range of specialist expertise. In Australia, 95% of all businesses in the building and construction industry employ fewer than 5 people while less than 1% has 20 or more employees (Calver & McLaughlin 2003). 75-85% of the value of the industry's production is delivered by subcontractor enterprises (CPSC 1998) and small businesses make up 96% of businesses in the construction industry (LC 1999).

The intense competition, heavy regulations, sensitivity to economical cycles, and fragmented industry structure pose the main challenges to managing construction projects. An organization's capabilities to effectively deal with these challenges could lead to competitive advantage. Construction contractors are typically at the centre of managing complex project deliveries. It is important to understand what constitute their capabilities in effectively dealing with these dynamic challenges.

This paper starts with an analysis of the dynamic challenges facing construction contractors. Literature on project, program and portfolio management, alliance management and project learning are reviewed to identify the core capabilities for successful construction project delivery. We then draw from strategy literature on dynamic capability and contend that the core project management capabilities form the core dynamic capabilities for construction contractors that may lead to competitive advantage.

CHALLENGES FACED BY CONSTRUCTION CONTRACTORS

The construction industry is heavily regulated by a range of legislations, regulations and standards such as the Building Codes of Australia, Australian Standards, Environmental Planning and Assessment act, Occupational Health and Safety Act. Construction contractors need to deliver quality projects within these constraints. For example, the Building Code of Australia and the Australian Standards provide the minimum regulatory requirements for the design and construction of buildings and other structures in Australia and covers matters such as structure, fire resistance, access and egress, fire-fighting equipment, mechanical ventilation, lift installation, and certain aspects of health and amenity. Although it is compulsory to meet the minimum standard requirements, it does not appear to be a major concern for large contractors. Instead, competition seems to be primarily focused on cost (Calver & McLaughlin 2003). Because construction projects are financially susceptible to project delays and the resulting liquidated damages, project delivery time is critical to their success (Walker & Sidwell 1998). Many construction contracts have incentives for on-time or early delivery.

The demand in the construction industry is very sensitive to national economic cycle and the movement of interest rates on economic activity (CPA 2004). Construction activities typically fluctuate widely around its average growth rate (Calver & McLaughlin 2003). The highly competitive, heavily regulated and fragmented nature of the construction industry coupled with the volatility of market conditions subject construction contractors to fluctuating demand levels. As a result, the industry

structure consists of many specialized firms and very lean structures in most large construction contractors. Typically, construction firms have no more than two levels separating top business unit level executives from project managers (Sauer, Liu & Johnston 2001). Moreover, most large contractors specialize in project management while sub-contracting most construction activities. Should an economic downturn occur, it allows them to survive without resorting to substantial organizational restructuring (Eccles 1981).

Typically, projects are acquired through competitive bidding. Since bidding for large projects are time-consuming and resource intensive, it is important that in the process of bidding contractors are able to identify the projects that it has a good chance to acquire and deliver with justifiable level of return. In addition, strategic prioritization and resource utilization are crucial to this process and should be factored in when selecting potential projects as it enables the organization to effectively plan the use of its limited organizational resources. Choosing the wrong projects could result in reduced economic returns or even loss. For example, Kangari (1988) found that 50% of construction business failures recorded in 1986 were due to low profit margins.

Once a project has been acquired, the contractor needs to quickly and effectively put together its resources to carry out the project. Since construction work is typically outsourced (Sullivan 1996), the contractor's capability to manage large number of subcontractors and partners is important to the successful delivery of the project.

Because of intense competition, delivering construction projects according to the conventional iron triangle (time, cost and quality) still remains to be the fundamental capabilities of construction contractors. Most construction contracts have penalties for exceeding the budget, late delivery and substandard quality.

More recently, there is also a shift in the construction clients' preferences for construction solutions. A growing number of clients are now looking for single solutions for complex problems. They prefer contractors to provide a total solution covering pre-construction to post-construction services instead of only project delivery. The former will comprise multiple service providers forming partnerships to supply packages solutions that extend beyond the typical range of construction services supplied by the industry (Calver & McLaughlin 2003; CPSC 1998), while in the latter the client has to incrementally acquire land, organize finances, develop services, build and manage the facilities. The client may prefer the contractor to provide the whole range of pre-construction services (which includes viewing and acquiring of land, organizing finances, developing services and design) and post-construction services (which includes maintaining, operating, sale or lease of project asset) while the client focus their attention on core business issues such as business development and total asset management. These capabilities that are required for construction contractors to deliver a total solution differ from project delivery in that the former address strategic needs (that of providing a total solution that addresses client's problems and realizing strategic benefits from the project assets) while the latter focuses on meeting the well-defined time, cost and quality requirements.

As the competition level increases, many large construction contractors are moving away from the traditional inwardly focused and adversarial method of procurement to an integrated partnering or strategic alliancing approach (Black, Akintoye & Fitzgerald 2000; Bresnen & Marshall 2000; Miozzo & Ivory 2000; Holt, Love & Li 2000) in construction contracting as a way of dealing with the fragmented and

disintegrated nature of the industry (Bresnen & Marshall 2000). The conventional adversarial approach to contracting often results in loss of productivity, increase in costs (Vaaland 2004), poor cooperation, confrontations (Latham 1994; ACTIVE 1996), and mistrust (Hawke 1994; Wong 2004)

For instance, under a traditional approach, subcontractors and suppliers are only brought into the project at a later stage and have a limited role at the design stage, resulting in the lack of the constructability input and maximisation of value engineering. This subsequently disrupts the program timetable and threatens variations due to aborted design work. By establishing trust-based, value-added and collaborative working relationship with the subcontractors, suppliers and other partners, contractors are able to enhance their ability to meet the client's program, quality, flexibility and cost requirements (Black, Akintoye & Fitzgerald 2000) through combining resources and expertise, deploying resources more effectively, better responses to changing market conditions, sharing of risks and the reduction of the learning curve (Bresnen & Marshall 2000; Black, Akintoye & Fitzgerald 2000). Therefore, there is a need to adopt a partnering approach in the industry, especially for large and complex projects. The ability to manage partnering relationship is critical to realize strategic benefits.

Another challenge facing the construction contractors is that of organizational learning. Projects are unique and temporary. Tacit knowledge gained during a project resides in the heads of team members. Once the project is completed, team members are often assigned to different projects and knowledge disappears with them. It is therefore critical for construction contractors to find ways to retain and improve working knowledge, routines and processes (Carrillo *et al.* 2004; Love & Huang 2004).

In summary, the key dynamic challenges facing construction contractors include:

- Choosing and acquiring the right projects
- Prioritisation of projects
- Allocate resources effectively and efficiently to projects
- Mobilize resources quickly and effectively
- Deliver projects successfully within constraints
- Managing alliance to deliver total solutions and realizing strategic benefits
- Effective cross-project learning

CORE PROJECT MANAGEMENT CAPABILITIES

In this section, we review project management related literature to identify core capabilities that are needed by the construction contractors to deal with the dynamic challenges facing them. Since most work in the construction industry is organized in the form of projects and that the construction industry is the first commercial industry to widely apply project management techniques (Morris 1994), our review starts with project management theory. Subsequently, literature on alliance management and project learning in the context of construction project management are reviewed.

Project management refers to efforts designed to provide a sustained, intensified and integrated management of complex ventures, and to direct and coordinate human and non-human resources into a temporary organization to achieve clear, well-defined and predetermined objectives as well as deliverables of scope, cost, time, quality and participation satisfaction (Wideman 1986; Adams, 1988).

Projects have fixed beginnings and ends and are managed within a set of constraints. The body of knowledge on project management covers a wide range of topics such as procurement, contract management, project planning and control, etc. Project Management Body Of Knowledge (PMBOK) developed by PMI (PMI 2000) represents one of the most comprehensive compilation of knowledge related to project management which has become the de-facto standard for project management practitioners, especially in the construction industry. Our focus here is on identifying the key organizational capabilities that are enabled by project management approach.

Traditionally, the main focus of project management has been on delivering projects within constraints (Morris 1994). The typical project constraints are often referred to as the iron triangle of time, cost and quality. Our contention here is that project management enables an organization to deliver projects within constraints consistently. We call this capability Project Delivery Capability.

More recently, project management theory has been criticized for narrowly emphasizing on satisfying project constraints and not on actively pursuing business benefits. Research has since been extended to program management, project portfolio management and organizational-level management (Morris 1994; Thiry 2002). For instance, PMI's (2003) new organizational project management maturity model, OPM3, has reflected the concept of combining the 'Best Practices' of the three separate domains of project, program and portfolio management.

As opposed to delivering a project to clearly defined targets and constraints, program management focuses on the realization of strategic benefits (Thiry 2002). The expected strategic benefits are often ambiguous and require strategic planning and management efforts to realize the benefits (Remenyi 1998). Typically, a program involves management of a group of inter-related projects and program management frequently extends beyond the traditional project delivery cycle from winning a contract to project handover (Lycett, Rassau & Danson 2004). For example, the governments in UK and Australia are increasingly adopting the privately financed project (PFP) form of delivery for infrastructure projects. In this type of arrangement, the private party is required to arrange financing for the project, planning of the business operation, delivery of the project, operate and maintain the project for a certain period of time. It is up to the private party to make a reasonable return on the program (strategic benefit). The distinct capability enabled by program management is the ability to realize strategic benefits. We call this capability Benefit Realization Capability.

Another critical capability for effective program management is the ability to manage alliance partners. Strategic partnership or alliances refers to "long-term agreements between companies to cooperate to an unusually high degree to achieve separate yet complementary objectives" (CII 1991, p. iv). Such long-term partnerships, if developed and maintained into working relationships, could bestow construction contractors with the capability to mobilise resources efficiently and agilely. Despite the potential benefits, alliances are hard to manage and half of those formed end up in failures (Bleeke & Ernst 1993) suggesting that alliance management capability is a critical capability. Since most programs are large and complex undertakings that typically involve many parties, the ability to effectively manage the collaborations between the parties is critical to program success (Black, Akintoye & Fitzgerald 2000; Bresnen & Marshall 2000). As more and more construction contractors adopt the strategic alliance approach on large and complex projects, there is a compelling need

for Alliance Management Capability. Hence, we contend that these two capabilities inherent in program management enable an organization to deliver solutions, and realize its strategic benefits through the appropriate development and management of its alliances.

Portfolio management was developed in recent years to address the need for project selection and prioritization, and resource allocation among multiple project/programs (Dye & Pennypackers 1999; Artto, Martinsuo & Aalto 2001). In the selection and prioritization process, project objectives are evaluated against corporate objectives, total risk profile and resource commitment with a goal to achieve broader corporate strategies (Dye & Pennypackers 1999; Artto, Martinsuo & Aalto 2001). Once the project/program mix has been decided, and projects prioritized, projects are selected, accelerated, killed or de-prioritised in the resource allocation processes (Artto, Martinsuo & Aalto 2001). The primary purpose of portfolio management is to enable firms to select and acquire the right projects, and prioritize them. We call this capability Project Selection and Prioritization Capability. Without it, projects compete with one another to secure scarce organizational resources. Resources may not be fairly allocated and dissension between projects and its members result in conflicts. Studies have shown that competition between projects is not in the best interests of the organization as a whole (Lord 1993) and that competition creates anxiety that interferes with performance (Moss-Kanter 1989).

After the selection decision has been made, the organization needs to spread its limited resources to the portfolio of projects according to its strategic priorities. It is important to avoid both over-commitment and inadequate utilization of resources. Over-commitment could have disastrous results for the organization (Turner 1999) whereby important projects are starved of critical resources while less important ones compete fiercely for the scarce resources. Similarly, under-utilization of available resources leads to resources being idled away. Portfolio management offers construction contractors a capability known as Resource Allocation Capability. We contend that this capability enables a contractor to allocate its scarce resources appropriately and adequately to the projects in accordance with their strategic priorities. Furthermore, such a capability coupled with strong partnership relations (developed and managed appropriately via Alliance Management Capability), will enable firms to mobilize their resources quickly and effectively. For instance, contractors that have had strong, cooperative and long-term partnership arrangements with their subcontractors would be able to mobilize their resources more quickly, efficiently and effectively as compared with their competitors who do not.

The other important capability in portfolio management is the construction contractors' ability to learn across its projects. Cross-project learning enables an organization to have a bird's-eye-view of all its projects/programs, and for it to be able to systematically assess and review lessons learnt from one project/program and apply it to another, through its organizational routines and processes. This allows valuable information and knowledge that is accumulated to be articulated and codified between projects; thereby preventing knowledge from disappearing with its project members at the end of a project and from being gained in a 'hit and miss' fashion (Frame 1995). This is much more valuable than learning from past projects where knowledge and experience are oftentimes not recorded or not transferred to other projects (Lycett, Rassau & Danson 2004).

Hence, it is pertinent that construction contractors establish, maintain and enhance their learning capability as it is one of the key factors leading to consistently successful projects (Cooke 2002). We call this capability Cross-Project Learning Capability and contend that this capability enables effective cross-project learning to occur.

Table 1 summarizes the PM core capabilities in the construction industry. Alliance Management Capability and Cross-project Learning Capability are categorised under Enterprise-level Management because they can be implemented at all levels although Program Management and Portfolio Management are the most relevant areas.

Table 1 Project Management Capabilities

Relevant Management Theory	Core Capabilities
Project Management	<i>Project Delivery Capability: The ability to deliver projects successfully and consistently within constraints.</i>
Program Management	<i>Benefit Realization Capability: The ability to realize strategic benefits.</i>
Portfolio Management	<i>Project Selection & Prioritization Capability: The ability to identify and acquire 'right' projects/programs.</i>
	<i>Resource Allocation Capability: The ability to dynamically allocate limited resources to projects/programs according to strategic priorities.</i>
Enterprise-level Management	<i>Alliance Management Capability: The ability to develop and manage long-term, co-operative and value-adding partnership relations.</i>
	<i>Cross-project Learning Capability: The ability to learn from previous projects, and utilise accumulated knowledge, experience and expertise in forthcoming projects or/and learn between projects that are running concurrently.</i>

Alliance Management, for instance, is often practiced at the program level where performance risk is typically high, and where full-cooperation and expertise of project partners are required. At the project level, where scope and objectives can be clearly defined and articulated, the approach to managing project partners is still largely based on traditional adversarial contracting approach. In addition, top management is often actively involved in developing and maintaining long-term relationships with value-adding strategic partners. Identifying and developing strategic partnership is a strategic issue that requires the attention of executives at the portfolio and program levels.

Similarly, learning can be achieved during a project or a program through means such as project reviews, prototyping and mentoring. Nevertheless, intervention from top management is needed to ensure effective cross-project learning. For example, enterprise project office is a mechanism widely used to facilitate cross-project learning.

DYNAMIC CAPABILITIES FOR CONSTRUCTION CONTRACTORS

In this section, drawing from literature on dynamic capability, we argue that the core capabilities discussed above form the core dynamic capabilities required to effectively deal with the challenges facing construction contractors. Below, we first review the concept of dynamic capability. Then, the links between dynamic capability, project management capability and the challenges facing construction contractors are discussed.

Dynamic capability is defined as “The firm’s processes that use resources—specifically the processes to integrate, reconfigure, gain and release resources—to match and even create market change” (Eisenhardt & Martin 2000). Zollo & Winter (2002) describe dynamic capability as a learned and stable pattern of collective activity through which an organization systematically generates and modifies its operating routines in pursuit of improved effectiveness. Some authors further posit that dynamic capability arise from the learning mechanisms of organizational routines, knowledge accumulation, articulation and codification which constitute the firms’ systematic methods of modifying routines (Zollo & Winter 2002; Marsh & Stock 2003).

Dynamic capability can be characterized by its reliance on organizational routines and processes (Winter 2003). In other words, dynamic capability is the capability that is derived systematically from routines and processes rather than ad-hoc decision making. For example, improvisation by a senior executive to resolve an unforeseen crisis is not considered dynamic capability.

The pattern of effective dynamic capabilities depends on market dynamism (Eisenhardt & Martin 2000). In a moderately dynamic market like the construction industry, the industry structure as being relatively stable where the key players in the industry are well known, changes are frequent but roughly predictable, and the emphasis of managing projects is planning (Williams 2004). Here, effective dynamic capabilities rely much on existing knowledge typically in the form of routines and business processes (Eisenhardt & Martin 2000). In contrast, in a highly dynamic market such as the IT suppliers market, successful business models are unclear, market players are ambiguous and shifting, changes are difficult to predict, and the dominant management logic is on exploring and experimenting with opportunities (Eisenhardt & Martin 2000). Effective dynamic capabilities in such markets rely heavily on newly generated, situation-specific knowledge and less on existing knowledge (Eisenhardt & Martin 2000).

A necessary attribute of dynamic capability is its continuous learning and improvement efforts in adapting its underlying routines and processes (Zollo & Winter 2002). For instance, a static operating procedure that does not require continuous improvement and adaptation is not dynamic capability. Examples of dynamic capability include product development routines, alliancing routines, exit routines and knowledge management routines (Eisenhardt & Martin 2000).

The core project management capabilities for construction contractors identified in Table 1 are very much process-driven (Sauer, Liu & Johnston 2001), requires tailoring to an organization’s specific circumstances (OGC 2002) and needs continuous improvement efforts (Cooke 2002). PRINCE2 (OGC 2002) is one of the

most widely adopted project management methodology which is heavily process-driven. It covers project, program, portfolio and enterprise level management. Implementing PRINCE2 in any organization requires significant tailoring effort (OGC 2002). The roles and mechanisms for continuous learning across projects are built into the processes (OGC 2002). Similarly, other project management related frameworks such as the capability maturity models (CMM) from Software Engineering Institute (SEI) and LogFrame by USAid, are also process-driven and require tailoring efforts and continuous improvement efforts.

Since projects are unique and their management is process-driven, adapting project management processes to individual projects and changing business environment could be a major source of competitive advantage for construction contractors.

On the business-environment side, the construction industry is heavily regulated where these regulations are subject to frequent changes (LC 1999). The competition is intense in this industry both on project costs and delivery time. The demand of the industry is volatile and depends on macro-economic cycles. As discussed earlier, these competitive forces result in a number of challenges to the construction contractors. To effectively deal with these challenges, a construction contractor needs to improve its ability to identify, acquire and deliver projects, mobilizing and allocating resources, realizing strategic benefits, managing alliance and learning across projects. One of the recommended improvement mechanisms in project methodologies such as PRINCE2 is a dedicated office with responsibilities for process improvement. Project management capabilities identified in Table 1 addresses each of these challenges. Since project management capabilities are process-based, addresses dynamic competitive forces, and the routines as well as processes are subject to continuous improvement efforts, they are the core dynamic capabilities for construction contractors.

It needs to be emphasized that project management efforts at the four different levels form a coherent set of capabilities. The level of capabilities in each area depends on the organization's needs and existing capabilities. For example, an organization may choose to focus on enterprise-level, portfolio and program level capabilities while outsourcing project delivery capability. Nevertheless, all capabilities identified in Table 1 are needed for a construction contractor to succeed in the long-term whether it resides outside the firm or within the firm.

DISCUSSIONS

The purpose of this paper is to outline the core processes and routines that form the core of the dynamic capabilities for construction contractors. Understanding the composition and characteristics of effective dynamic capabilities, construction contractors will be able to develop and deploy effective dynamic capabilities over time.

As suggested by Eisenhardt & Martin (2000), dynamic capabilities are a necessary but not sufficient condition for sustained competitive advantage. At least some of the dynamic capabilities can be imitated by competitors. For example, assigning mentors to project managers and establishing the role of project director for overseeing construction projects are common among leading Australian construction contractors (Sauer, Liu & Johnston 2001). Therefore dynamic capabilities themselves cannot be a source for long-term competitive advantage. Sustained competitive advantage is

likely to lie in the resource configurations which contractors created through applying dynamic capabilities (Eisenhardt & Martin 2000). The implication for construction contractors is that the advantage created by PM capabilities is likely to be short-term and it therefore makes sense to create a series of temporary advantages through reconfiguring resources. For example, strong alliance management capability may enable a contractor to create an advantage in acquiring and delivering complex projects by teaming up with organisations with complementary skills quickly and efficiently. A contractor may choose to focus on developing some PM capabilities and select long-term partner organisations with complementary PM capabilities.

Dynamic capability cannot be assembled through the market Teece (1982; 1986). It requires continuous learning and improvement efforts (Zollo & Winter 2002). It is therefore critical for construction contractors to develop project management routines and processes through persistent process improvement initiatives. Generic project management methodologies that are implemented without tailoring and subsequent improvement efforts to an organization are likely to result in failures.

CONCLUSION

The competitive forces in the construction industry result in 8 specific challenges for construction contractors. Project management capabilities that evolved in the construction industry over the past few decades, if properly implemented, could effectively address each of these challenges. The project management capabilities identified at project, program, portfolio and enterprise levels include Project Delivery Capability, Benefit Realization Capability, Project Selection & Prioritization Capability, Resource Allocation Capability, Alliance Management Capability and Cross-project Learning Capability. This paper contends that project management capabilities form the core of dynamic capabilities required by construction contractors to effectively compete in this industry. Underpinning dynamic capability is an organizational learning process that continuously strives to improve and adapt its operating routines and processes.

The unbundled PM capabilities help construction contractors to choose and focus on developing core capabilities and form alliances with partners with complementary capabilities to effectively compete in the market place. We hope this paper provides useful guidance for future empirical research on the link between dynamic capability and project management, and on the core capabilities for construction contractors.

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