
An open framework for corporate strategy in construction

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Abstract

A new conceptual model for corporate strategy in the construction industry is presented that is derived from two principal inputs. First, the fundamental components of the model are based upon observations drawn from an empirical study of 24 international firms competing in global engineering and construction markets. Second, the accumulated intellect of different strategic theories developed over four decades of strategic management research helps to fortify the model with theoretical propositions and establish linkages among the model's basic components. The proposed model is comprised of seven strategic fields, two organizational mechanisms and a boundary notion that divides a firm's internal setting from its external environment. The model's development leads to two central propositions: strategic fields and organizational mechanisms should function as variables to react with external dynamics, and the interaction of these variables consequently promotes higher order differentiation factors that will enhance the strategic outlook of a firm.

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Introduction

Over roughly the last half century, strategy has grown from a practice of military commanders and corporate executives into the field of management science. During this time, it has enjoyed contributions from various disciplines such as economics, organizational sociology, political science and cognitive psychology (Rumelt *et al.*, 1994). Not surprisingly, differing perspectives of strategy development and implementation have evolved, centering generally on one's view of the capacity and motives of individuals and organizations (Whittington, 2001). Mainstream strategic studies, however, have not typically considered the construction industry, and conventional thought within the industry has often downplayed strategy's significance.

Of late, construction industry researchers have changed this perception to some degree as publications regarding strategic management have increased. Warszawski (1996) outlined a methodological procedure for strategic planning in construction companies. Serving as somewhat of a "primer" to construction professionals on the topic, he discussed the definition of company's mission, the significance of business environment, and a broad outline of the steps involved in analyzing a company's resources. His elaboration on the development of competitive strategy was based largely on Porter's (1980) theory of generic strategy. Later, Chinowsky and Meredith (2000) conducted a survey to identify areas of strategic concern that civil engineering organizations need to emphasize. Other researchers have focused on more specific approaches within the strategic management. For example, to aid construction firms in the selection of long-term strategies, Venegas and Alarcón (1997) first proposed a simplified model of variables affecting strategic decisions before recommending a mathematical model to predict the impact of the decisions. Junnonen (1998) also made an attempt to relate Goold *et al.*'s (1994) concept of "parenting advantage" to strategy formation in the context of construction.

The above list is not exhaustive, but this area still does not receive the attention it deserves within the construction industry. Kale and Arditi (2002) pointed out that the research on competitive positioning is too slanted towards anecdotal and descriptive approaches, while empirical studies to validate or refute hypotheses are lacking. On this issue, the authors believe that both descriptive and empirical approaches actually serve different purposes in solving strategic puzzles – simply because strategy is both an art and a science. Moreover, characteristics of the



construction industry are quite different from those that provided the underpinnings of prevailing theories of strategy in the mainstream. Given the limited amount of research on strategic management issues in construction at this juncture, more efforts from both descriptive and empirical fronts would do more good than harm.

These circumstances motivated a research program to make further propositions and to derive a new model for strategy development in the construction industrial environment. The resulting model is presented in this paper. The model was induced from empirical findings, case analyses and theoretical review – thus it is a blend of both descriptive and empirical approaches. More importantly, unlike previous research work, the resulting model emanates from a different philosophical construct. It focuses on the rudimentary principles of competitive advantage – emphasizing the significance of an all-encompassing view of corporate strategy, rather than placing singular emphasis on the downstream strategy formation process (Venegas and Alarcón, 1997) or the observed outcomes (Chinowsky and Meredith, 2000; Kale and Arditi, 2002). This makes the model more generic in nature and the model acknowledges that the detailed strategy development is often situational.

Selected empirical findings

The methodology adopted simultaneously studied a sample of firms and established theories of strategy development. The firm sample included 24 international organizations, and the findings from this empirical study produced some interesting conclusions on corporate strategy related to engineering and construction (E&C) firms (Cheah, 2002). These are all large E&C firms, with most of them placed among the top 50 of the *Engineering News Record's* ranking according to their international construction revenue. The study focused on the analysis of trends of both financial and operational performance data using indicators such as profitability, liquidity, leverage ratios and other quantitative measures spanning between 1997 and 2001. The primary source of data used in this study was publicly available information including annual reports, journal articles and press releases. To minimize distortion due to different accounting reporting practices and managerial biases, figures were adjusted wherever applicable following the recommended guidelines (Haskins *et al.*, 2000; White *et al.*, 1997). Interviews with officials from a few of these firms were also conducted

to confirm the broad outlook of the firms and their operating markets.

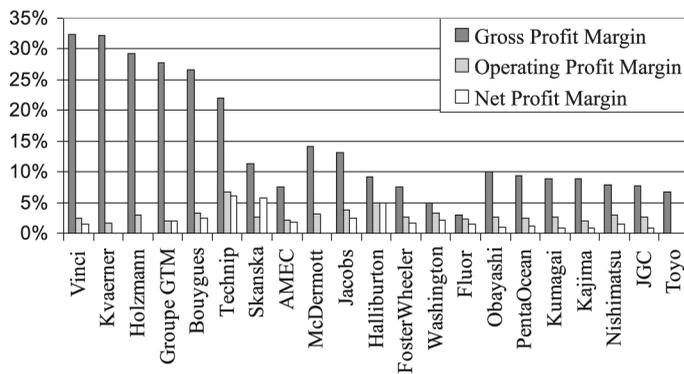
The trends of quantitative data were interpreted in the light of qualitative information such as executives' and employees' turnover, trends of dividend payout, market conditions during the 5 year period and other issues ranging from corporate governance to the competitive outlook of firms – some of which have diversified beyond “pure” construction activities. The research recognizes the importance of “calibrating” the quantitative findings by keeping track of “softer” issues, particularly chronological acts leading to significant events such as bankruptcy, mergers and acquisitions, or internal restructuring. The model's merit and its credibility are founded upon this patient observation and scrutiny of information in different areas.

To illustrate, Figure 1 shows one of the examples of cross-sectional comparison of profitability measures, which have been normalized across the study period. The firms are clustered in groups of similar geographical region (in the sequence of Europe, US and Japan), but the figure also facilitates comparison across the entire sample. Trends for other indicators were also constructed, including conventional financial ratios (e.g. liquidity and debt ratios) and newly-created indicators (e.g. $(\text{Revenue})_{i,t}$ -to- $(\text{Backlog})_{i,t-1}$ ratio that tracks cancellation of orders etc.).

Through a review of these trends, coupled with an understanding of corporate events behind the scene, firms are compared in a relative sense against their regional peers and categorized as “outperform”, “moderate” or “underperform” – as shown in Table I. By isolating firms into separate categories, factors leading to successes and failures could be better understood. Since the focus of this paper is the resulting model, presentation of all the details of the methodology and the findings is neither appropriate nor practical. Interested readers can refer to Cheah (2002) or a forthcoming journal paper by Cheah *et al.* (2004) for further discussion.

Overall, some firms grew successfully along market and geographical dimensions while preserving reasonable profitability postures; others failed miserably and even filed for bankruptcy. Some firms also projected admirable figures in some categories of indicators, but ultimately failed simply because one or two other critical factors had been overlooked. Table II, for example, illustrates the diversity of operating and financial performance of the alleged underperforming firms. Their diversity also extends to other softer aspects such as the strategic dichotomy of

Figure 1 Gross, operating and net profit margins of firm sample



Notes: Clustered by each corresponding region; Arranged in descending order of GPM

diversification vs focused differentiation. In many cases, these overlooked factors originated from areas beyond the technical civil engineering and project management aspects in construction; they were associated with more general management issues. Incidentally, these “other” issues are becoming more prevalent in E&C business – as projects have evolved into systems, and competition has become more global.

Philosophical construct of the model

The empirical study supported two basic conclusions about the construction industry:

- (1) both factors of success and causes of failure are diverse (as supported by the type of observations similar to Table II); and
- (2) a universal formula for excellence is arguably nonexistent.

While this may not sound earth-shattering, it does subtly hint that debates over the merit of common management dichotomies, such as diversification vs focused differentiation, or planning vs learning (Ansoff, 1991; Mintzberg, 1990, 1991), appear rather hollow. It is more appropriate to take the view that corporate strategy must encompass a variety of dimensions. In relation to this argument, Whittington (2001) conducted an excellent review of strategic theories developed over the past four decades and categorized them into four different schools of thought: *Classical*, *Evolutionary*, *Processual*, and *Systemic*. In view of the characteristics of their theories, Porter and Ansoff, for example, have been classified as “Classicists” while Mintzberg is classified as a “Processualist”. In the end, Whittington claimed that the strategy

Table I Ranking criteria (partial list) and relative performance of firms

	Regional size ranking based on total assets	Regional ranking based on profitability measures				Rating
		Return on assets	Return on equity	Net profit margin	Operating profit margin	
Halliburton	1	1	2	1	1	O
Fluor	2	5	5	6	6	M
Foster Wheeler	3	6	6	5	5	M
McDermott	4	N/R	N/R	N/R	4	M
Jacobs	5	2	1	3	2	O
Raytheon E&C	6	N/R	N/R	N/R	N/R	M
WGI	7	3	3	4	3	U
Stone and Webster	8	4	4	2	N/R	U
Bouygues	1	4	6	4	2	M
Vinci	2	6	4	7	5	M
Skanska	3	1	1	2	4	O
Groupe GTM	4	5	5	5	7	M
Kvaerner	5	N/R	N/R	N/R	N/R	U
Holzmann	6	N/R	N/R	N/R	3	U
AMEC	7	3	3	6	6	M
Technip	8	2	2	1	1	O
Kajima	1	4	4	4	6	M
Obayashi	2	3	3	3	2	M
Kumagai Gumi	3	N/R	N/R	N/R	4	U
Nishimatsu	4	1	1	1	1	O
Penta-Ocean	5	2	2	2	5	O
JGC	6	5	5	5	3	M
Toyo	7	N/R	N/R	N/R	N/R	U
Chiyoda	8	N/R	N/R	N/R	N/R	U

Notes: N/R = not rated, due to excessive fluctuation in study measures or data unavailability; O = outperformed the others in the sample; U = underperformed; M = moderate performance

Table II Underperforming firms – diverse causes of problems

	Operational performance			Financial performance	
	Profitability	Revenue conversion	Collection period	Leverage	Liquidity
Toyo Engineering	Low	Low	High	OK	OK
Chiyoda	Low	OK	OK	High total debt	Low
Kumagai Gumi	OK	Low	High	High	Very low
Kvaerner	OK	OK	OK	High long-term debt	OK
Philipp Holzmann	OK	OK	OK	High	Low
Stone and Webster	OK	Low	OK	OK	OK
Washington Group	OK	OK	OK	OK	OK

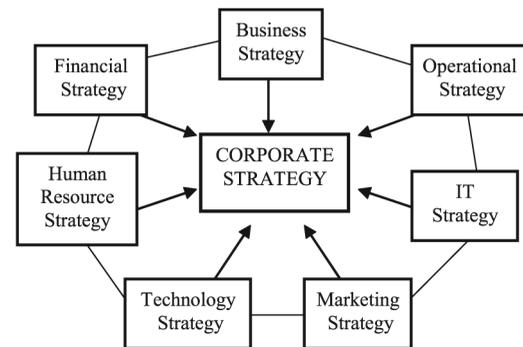
is dynamic and no single school of thought should dominate in all circumstances.

Whittington's insights are inline with the spirit and philosophical construct that is fundamental to the conceptual model presented here. In the absence of an absolute and optimal solution, a form akin to that of a contingency model is adopted. In other words, the focus of the model should reside on just a few important guiding principles, instead of elaborative and detailed arguments that would become inapplicable even under slightly differing circumstances. By adopting an "open" format instead of a "closed-form" step-by-step formulation, the model is by default generic and dynamic. In practice, detailed implementations will depend on specific internal issues and external factors faced by corporate executives at any particular point of time; the details are best left to them to decide on a situational basis. This attribute of the model is particularly relevant given the diversity and localized nature of the E&C business. Also, the model should be relevant to any firm within a typical construction value system. As such, it is generically applicable to suppliers, contractors, consultants, project sponsors and developers.

The starting point of the basic model also realizes that any discussion of corporate strategy should always parallel the mechanisms within an organization. Distinctive components link corporate strategy and the organization and drive their interaction. In the following section, these components are first introduced and defined. Thereafter, the components are put in perspective by viewing them in a broader context. Implications drawn from the conceptual model are then discussed before closing with a summary and conclusions.

Inside corporate strategy – the seven strategic fields

The model divides corporate strategy into seven strategic fields as shown in Figure 2. All strategic fields rightly are separate, major components

Figure 2 Seven strategic fields of corporate strategy

within the realm of corporate strategy. Whereas some strategic models such as Porter's (1985) value chain concept treated activities like human resource (HR) management merely as supporting activities, this model casts these strategic fields as distinct areas since they have currently evolved into disciplines requiring separate planning and execution. As evidence, most business schools at present offer separate courses for each of these fields after a general treatment of the topic of strategic management.

Conflicts among individual fields are not new (Barwise *et al.*, 1989). The key challenge lies in how to integrate these fields effectively to derive a coherent corporate strategy. Given the wide scope embodied within each field, it is not possible to elaborate their full details. Rather, the following sections aim to provide a synopsis of more important issues within each field so as to set the stage for subsequent discussion on the overall framework.

Business strategy

The distinction between "business" and "corporate" strategy is often made in the literature. Frequently, "business strategy" is defined as strategies adopted to ensure successful ventures of individual business units, whereas "corporate strategy" is concerned with operations of the entire organization. This distinction is obviously consistent with the model, since business strategy

is one of the seven core fields of the overall structure.

As perhaps the most popular field among researchers and theorists, business strategy formally deals with the development of competitive advantage and core competencies. In particular, Porter's (1980, 1985) techniques such as the determination of uniqueness and cost drivers, the "Five Forces" model, and the market segmentation matrix are some commonly known concepts in formulating business strategy – though not without criticisms of their limitations. Other theorists choose to forget such rhetoric and instead address simple (yet subtle) fundamental questions such as "what markets are we in?" and "what value are we creating for our customers?" In short, business strategy is traditionally the primary area of concern. It focuses on the products and services that a firm could offer, should offer, or is targeting to offer.

Financial strategy

No business venture can operate without the consideration of financial issues. There are two fundamental aspects in financial strategy: investment decisions and financing decisions. During investment decisions, firms are confronted with the challenges of capital budgeting and financial resource allocation. In order to make better decisions, managers must select the appropriate tools for project analysis and evaluation, which include, but are not limited to, the net present value (NPV) method, decision tree analysis, optimization, portfolio planning and real option valuation. Behind these tools lies a common and fundamental principle of balancing risk and return. Financing decisions, on the other hand, are concerned with issues of capital structure. Firms have to understand the relative pros and cons of using various kinds of debt and equity instruments in raising capital and the corporate governance structure associated with these financing decisions. For example, simple capital structures usually reduce restructuring costs. Complex structures with a combination of secured private debt and numerous subordinated public debt issues have been found to be strong impediments to out-of-court negotiations and settlements (Asquith *et al.*, 1994). In providing the detailed mechanics, Grinblatt and Titman (1998) showed how investment and financing decisions could impact the corporate strategy as a whole.

In the context of the construction industry, conventional contractual elements such as surety bonds and insurance policies are closely related to financial strategy. For example, a strong balance sheet is one of the primary necessities to continually secure surety bonds for ongoing project procurements. Reliance on insurance for

risk transfer is also intrinsically linked to the risk management policy of a firm. Some major construction firms have even extended the realm of financial strategy beyond internal implementation. In effect, these firms offer their knowledge and network relationships in this area as additional services to clients in terms of structuring innovative financial packages, particularly in build-operate-transfer (BOT) projects.

Operational strategy

Operational strategy is primarily concerned with execution and implementation – how firms manage their operational processes to convert different inputs into final products and services. These activities might include inbound and outbound logistics, procurement functions, production processes for physical products such as precast components, and procedural functions for service provision. For contractors, these activities are analogous to most project management functions such as material procurement, construction of the physical structure, and management of labor and machinery. Likewise, service firms utilize their expertise and knowledge to assist clients in fulfilling their needs and goals, as in planning, design and engineering functions.

Most research efforts in civil engineering traditionally focus upon technical areas (as in engineering design and analysis) or project-level management issues (rather than firm- and industry-levels). Therefore, most of the knowledge developed by conventional research efforts is directly related to operational strategy. However, civil engineers often address many issues that go beyond the boundary of operational strategy. For example, project execution onsite calls for a basic control of quality, costs and time. However, quality, costs and time can be profoundly affected by technological factors, which are in fact related to a firm's current technology strategy (discussed below). Project costs also bear an impact on cash flow at the corporate level, the sufficiency of which is again related to the specific financial strategy pursued.

Technology strategy

Tatum (1988) illustrated that the range of possible technology-based strategies for construction firms is wide. At present, choices and means for technology development still remain as the most basic questions in technology strategy. Three primary issues particularly stand out.

The first issue is the notion of "pioneer versus follower". Not surprisingly, whether one should be at the "bleeding edge" of the technology wave as a first mover is always a tough decision to make. This is especially true when technological trends

are shaped by uncertain environmental factors. The empirical study (Cheah, 2002) illustrated that no dominant fuel source technology has emerged for power generation from among the various alternatives: coal, natural gas, hydropower, nuclear power, non-conventional renewable energies (wind, solar, tidal) and others. When environmental, economic, technical and political factors are considered collectively, each stands a chance to emerge as a winner in the short, medium or long run.

The second issue deals with integration. In the past, many firms managed to establish operational advantage by achieving economies of scale through vertical integration. Large Japanese contractors, for example, have their own research institutes and tend to develop their technology internally. Alternative means of technology development, however, abound. For example, Chesbrough and Teece (1996) define innovations as either autonomous or systemic, each of which will determine the appropriate alternative between outsourcing and internalized technology development. Thus, if technological innovation for a particular process or product has to be driven by integrating functions along a value chain, it is more inclined to be systemic, and scale and integration would provide distinctive advantage. The converse, however, is also true.

Third, firms have to assess the relative importance between basic and applied research in order to allocate resources accordingly. This importance is clearly illustrated by the structure of Kajima Corporation, which houses most of its R&D efforts in two different groups – the technical research institute (TRI) and the advanced technology departments that are linked with different market divisions. While the latter group is more oriented towards developing applications in each respective market, the former group focuses more on basic research.

Information technology strategy

In this conceptual model, IT strategy is separated from technology strategy. Specifically, IT strategy focuses mainly on the use of technology to leverage information to the advantage of a firm. This contrasts with other types of technology development in general. This distinction is justified by the fact that information technology has grown into a separate market segment and research area since the mid-1990s.

The primary emphasis of IT strategy should be directed towards building a stronger appreciation of how IT can impact corporate strategy, rather than muddling in the technological aspects per se. At its prime, IT is often taken as the “driver” of corporate strategy. More appropriately, it should

be treated as an “enabler” that connects the corporate strategy of a firm with its operational processes (Ross and Rockart, 1999). In many aspects, the current trends of IT investment and implementation within the construction industry still appear to follow very vague goals. Too often, participants from the industry investing in IT (at least during initial stages) have forgotten their original identity as firms that provide construction services, thereby putting their core competencies at stake. In many cases, these investments are lacking in terms of establishing linkages between processes and corporate strategy in the long run.

It is worthwhile to note that the question of outsourcing vs internalization discussed in technology strategy is equally relevant to the implementation of IT strategy. For example, although purchasing “off-the-shelf” IT platforms and systems available in the market might be a less costly and less risky option, these systems might turn out to be too generic in nature to support long-term competitive advantage (if everyone can simply buy it, who can claim to have a competitive advantage over others?).

Human resource strategy

This is a field that constantly encounters “soft” issues. It should not be confused with operational aspects such as manpower deployment among different work sites or resource allocation for different tasks of a project – these issues fall under operational strategy in the context of this model. In essence, HR strategy is more concerned about the aspects of managing human assets of an organization. This often turns out to be a daunting task, which requires due consideration of internal and external issues. Some of these issues are:

- (1) personnel management (e.g. training programs; job rotation among functions and geographical regions);
- (2) industrial relations (e.g. employment law; union-management relationship; negotiation tactics and strategy);
- (3) incentives and compensation policies and systems; and
- (4) restructuring concerns (e.g. downsizing).

To put simply, the goal of HR strategy is to have an effective system for obtaining (recruiting), training, mobilizing and managing the human assets of an organization to systematically carry out business operations and new ventures.

Marketing strategy

As the terminology implies, marketing strategy requires one to look at the entire marketing mix in light of the strategy of a firm. In manufacturing and other industries that sell physical products, the

“Four Ps” (product, price, place and promotion) in conventional marketing management remains relevant at present, though changes in technology and IT have redefined the boundary and meaning of these components. Although construction is mainly service-oriented (except suppliers or vendors who are selling physical products), many of these concepts can be applied to selected parts of the construction value chain. For example, in terms of promotion, marketing strategy is especially important in signaling to clients the value created from the design of products and services in order to demand a price premium – differentiation is meaningless unless clients are able to perceive the value added that suits their unique needs. To achieve this, firms need to identify both needs (demand) and resources (supply factors), and choose the most efficient means of service provision. Some common corporate involvement in marketing strategy includes: umbrella branding and reputation building; logistics issues (a critical factor toward lean construction); and collection of information about clients’ needs (e.g. to improve facility operation and maintenance).

Two internal mechanisms of organization

Similar to the fields of strategy, there are several components that are critical to the functioning of an organization. Aspects that have received the most attention are organizational structure, corporate culture, organizational development and transformation. All these are closely related to the study of organizational behavior – an applied behavioral science that is built upon contributions from disciplines such as psychology, sociology, anthropology and political science (Robbins, 1998). By tracing the roots, it is evident that corporate strategy has some overlapping foundations with the study of organization. This reconfirms the earlier assertion that corporate strategy always parallels the internal mechanisms of an organization – both form the heart and soul of a corporation. For the purpose of the conceptual model, the internal mechanisms are confined to only two fundamental and complementary components: organizational structure and corporate culture.

Firm structure

Designing and structuring an organization is a complex task. Frameworks on structure as proposed by past researchers (Galbraith, 2000; Mintzberg, 1979) are useful in formalizing tasks, grouping members into effective teams, and linking these various processes and teams to

produce the final output of a firm. The gaps that exist within the system of formal authority in an organizational structure are often filled by the system of informal and social communication flow.

It is important to realize that a chosen structure is simply the means to achieve the ends of producing something that is valuable to clients. In general, organizational structure can be designed along four major dimensions: functions, product/service markets, geography and clients (Galbraith, 2000). Table III presents the different structures adopted by a few Japanese firms that were part of the empirical sample as of 2001.

In the course of settling on a chosen structure to deliver products and services, firms typically face various tradeoffs due to different advantages attached to each type of structures. Just as there is no optimal configuration among strategic fields, a perfect organizational structure is elusive. Some contemporary practitioners praise product/service teams for their great responsiveness to market condition and clients’ needs. The structure of product/service teams also coincides nicely with the profit and loss performance evaluation and accountability – something that is harder to achieve with a functional form. That said, the bureaucracy embedded within a functional hierarchical structure does serve its purpose of increasing control over specific resources (especially technical secrecy). A functional setting is also more amenable to the development of technical expertise within a specific discipline, particularly relevant in developing professional engineers. These features of a functional setting are commonly lacking in product/service teams.

Likewise, having peripheral geographical units poses both advantages and disadvantages. In terms of benefits, geographical units are easier to dispose of or downsize in case of changes in the market outlook. Exiting from a certain geographical market is potentially less chronic and less costly than receding from a market segment altogether. It is also easier to consolidate a few geographical operations into one, as opposed to integrating market and functional divisions. Conversely, the disadvantage of a geographical setting obviously comes from its difficulty in pooling knowledge and expertise under one roof in order to create innovative solutions for complex engineering problems. Overall, it is difficult to conclude which structural form is more superior.

Corporate culture

Whereas structure is important in defining individual responsibilities within the workflow process, a congruent culture will ensure that individuals carry out these responsibilities with minimum resistance. More importantly, strong

Table III Examples of primary and hybrid structures adopted by four Japanese firms

	Market/product	Geography	Function	Comments
Kajima	✓	✓	✓	Market segments focusing on building engineering, civil engineering, environmental engineering and maintenance services Geographical divisions exist: Kajima USA Inc.; Kajima Europe B.V.; Kajima Overseas Asia Pte. Ltd.; International Division that oversees the Middle East and Africa market; and regional headquarters in Japan for the domestic market
Obayashi	✓	–	✓	Functional setting retained for R&D; engineering design bases Market segments focusing on building construction, civil engineering and nuclear facilities Functional setting retained for architectural and engineering design and technology
JGC	✓	✓	Primary	Primary functional settings for project systems, engineering; procurement and sales and project management Market and geographical substructures mostly housed under these functional departments
Penta-Ocean	✓	✓	✓	More like a network of functional divisions operating under the umbrella of two main markets: civil engineering and architectural. International divisions exist for some functions

culture dictates the way that things should be done and creates expectations shared by group members, which are not outlined explicitly by a formal structure. In an attempt to clarify what “culture” really means, O’Reilly (1989) expresses culture as social control systems and normative order. The social control systems represent common agreements that exist among people about what constitutes appropriate attitude and behavior, and the norms set socially created standards that help the interpretation and evaluation of events governed by such control systems.

Culture is obviously a complex phenomenon, and its influence within an organization is ubiquitous. Brown (1998) and Pheysey (1993) provided in-depth discussions on linkages between culture and various management aspects including control systems, organizational design (structure), personal motivation and group behavior, decision-making and authority, organizational development and transformation. Schein (1992) also elaborates upon the role of culture and leadership. Among these broad concepts, some require further qualifications to suit the specificities of construction. For example, in the construction value system, some firms include a large number of professionals running operations that are technical in nature. Brown (1995) purported that management of technical organizations imposes different challenges, and traditional management concepts may not be blindly applied. He suggested that the major difference between the two is the elements of control. Referring to the former as “technimanagement”, Brown provided a detailed

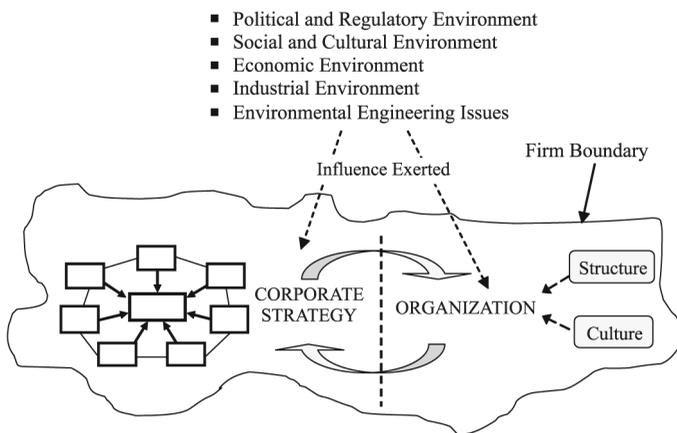
account of how certain traditional principles such as total quality management and McGregor’s (1960) theories X and Y need to be modified to cater for more profound human concerns in technical organizations. Thus, interactions among people within different management systems would cultivate unique corporate cultures over time.

Structure and culture – further discussions

Obviously, the complexities of structural and cultural issues extend beyond what have been briefly discussed. For example, such complexities increase exponentially when firms expand their business activities to the international level. In this case, phases of cultural development have to be planned (Howes and Tah, 2003), and organizational structure has to be redesigned to absorb changes in control and coordination mechanisms (Bartlett and Ghoshal, 1998; Galbraith, 2000). This is especially true given the nature of construction operations that largely demand responsiveness to the local environment.

Moreover, corporate culture can be influenced by industrial and national cultures (Hofstede, 1991) (both referred as the external cultural environment in Figure 3). According to Naoum (2001), the fragmented nature of the construction industry has led to “cultural diversity” among different specialized firms, which incidentally need to resolve their differences while engaged on any given project. Inevitably, frictions emerge in some circumstances, leading to what Latham (1993)

Figure 3 Big picture of the external environment, corporate strategy and organization



described as the existence of a culture of confrontation in construction.

Finally, structure and culture are often inextricably linked. For example, Mintzberg (1979) would view many of Brown's (1995) technimanagement concepts as related to his "adhocracy" structure, while Handy (1998) and Harrison (1972, 1987) might regard them as simply putting more weight on the "person/support culture". In fact, identification of such linkages should not be confined to merely structure and culture. This point is reinforced by a formal proposition later.

The big picture

The primary building blocks of corporate strategy and organization have already been introduced. It is subsequently important for firms to identify proper combinations of these building blocks for their success or survival. Nonetheless, although individual firms stand as the unit of analysis, they do not compete in isolation. During the course of strategy formulation, the boundary of the firm has to be defined, which is constantly exposed to dynamic influence of the external environment (Figure 3).

In Figure 3, the usual meanings of political, social, economic and industrial environment are generally clear, but the differences between external cultural environment and internal corporate culture should not be confused. The external cultural environment is typically beyond firms' control. On the other hand, internal corporate culture can be cultivated towards the kind of environment that a leader envisions the organization should have (for example, the case of Bouygues cited in Brown, 1998). As such, unlike

the external cultural environment, corporate culture should not be taken lightly as a predefined condition.

Highly influenced by these external environmental factors which are dynamic, decisions made to define boundary conditions are contingent upon a concurrent analysis and due consideration of the strategic fields and internal mechanisms of the organization. The wavy line shown in Figure 3 is intentionally drawn in such a manner to reflect the irregularity of a firm's boundary. It implies that the extent to which a firm chooses to enlarge or shrink its boundary will correspondingly alter the amount of influence exerted by these environmental factors. Firms can modify their boundaries along different dimensions – geography, market segments, or knowledge acquisition. Their actions may also be guided by different decision factors including the nature of clients, diversification, risk profiles, and the choice of modes (e.g. joint venture, direct acquisition) (Cheah, 2002). Eccles' (1981) notion of "quasi-firm", for example, illustrates the virtual extension of boundary within a market segment as a substitute for vertical integration. These boundary issues are fast emerging in scope, forming a key branch within strategic management, but such discussion is best addressed in a separate paper.

Implications of the conceptual model

Treating strategic fields and organizational mechanisms as variables

External environmental factors usually do not remain static but instead are increasingly tumultuous and dynamic. Ironically, firms often have to treat some of these factors as given and find ways to maneuver around obstacles. This indirectly causes the breakdown of "closed-form" models, which are based on fixed or slow-to-change boundary conditions, and in turn result in a rigid approach to strategic planning.

As a corollary, organizational leaders should treat the seven strategic fields and the two internal mechanisms of organization as variable building blocks of corporate strategy – these lie within the boundary and can be controlled by the firm. Effectively, these variables drive the "fluidity" of the firm boundary mentioned earlier. "Variables" imply flexibility and action, and this is essential to counteract tumultuous and ever changing external environmental pressure. Consequently, firms have to continually reassess their corporate strategy and organizational configuration against the external environmental factors. They must

ensure a proper fit among corporate strategy, organization and the external environment.

Interactions among variables

If fields and mechanisms are treated as variables then, there are numerous ways that they can interact – thus corporate strategy could take on different forms even when firms are competing in substantially similar sectors. Building on this belief, the following proposition is made:

Strategic actions that are derived from the interactions between two or more strategic fields are more powerful in shaping a sustainable and successful corporate strategy than those that are confined, both in terms of origination and impact, within only one single field.

One can also interpret “interactions” as “higher order” effects. To avoid the preceding arguments from getting too abstract, an analogy based on something closer to our fundamental training – engineering mathematics – can be drawn: a differential equation will capture more dynamic effects by incorporating higher order derivatives and more independent variables to provide a better picture in solving an engineering problem. The idea of:

- (1) treating the seven strategic fields and the two internal mechanisms as dynamic, interdependent variables, and
- (2) studying the interactions among them in order to formulate sustainable competitive advantages in this complex environment, is therefore conceptually not too different from solving a complex engineering problem using high-order differential equations!

Thus, following this line of thinking, a new technological process in construction by itself may not create a sustainable advantage unless the process also draws support from proper human resource strategy (e.g. a proper training plan in place), financial strategy (e.g. proper evaluation and budgeting for development, implementation and future upgrading of the process) and operational strategy (e.g. the new process compliments other best practices currently adopted in the firm’s projects). If the new technological process has built in characteristics that support two or more of these additional strategic fields (a form of interaction), it is arguably harder for competitors to imitate – hence forming a “higher order” differentiation factor.

Depending upon the circumstances, the process of molding fields and mechanisms into a desired configuration may be painful and lengthy. Cultural transformation, for one, is notoriously difficult. Still, the necessity to change has been emphasized by many (see, for example, the case of British Rail in Dumaine (1993), Gowler *et al.* (1998),

Hamel and Prahalad’s (1994) arguments of “core rigidity” and “unlearning”). In the authors’ opinion, management should at least assess the plausibility of implementing these changes rather than staying out altogether. While a frequent change in strategy and organization will be disruptive, performing such a check in a regular manner will enable a firm to have great foresight to plan before a crisis dawns. After all, maintaining an “adaptive culture” (Kotter and Heskett, 1992) is desirable (to motivate changes in *other* variables) even when circumstances suggest that culture itself should not be treated as a variable.

Brief illustrations

To illustrate the propositions presented in the previous section, Table IV provides a contrasting outlook between Philipp Holzmann and Skanska. In the case of the former, there is a lack of fit among the few variables listed. More constructive interactions exist in Skanska’s situation, and competitors would have difficulty imitating them in the short run and this leads to higher-order differentiation. The argument can be extended to other variables which are not listed. For example, due to its growth and acquisition strategy, most of Skanska’s operations remain relatively independent and decentralized. The company is currently working on several HR strategy initiatives to develop a common set of values and a coherent culture so as to stimulate collaboration and resource mobility across companies and countries. Essentially, its IT strategy also has a role in enhancing communication. These examples demonstrate the importance of recognizing strategic fields, structure and culture as interacting variables and essential levers that drive corporate strategy in the long run.

Summary and conclusions

This paper presents a conceptual model that adopts an open, generic format to cater to the diversities of success and failure factors in construction and the different theories related to strategy development. In the context of strategic management, operational strategy has dominated the conventional civil engineering research and construction industry studies. Thus, industry knowledge within this domain is rather mature, but it is generally lacking in other areas. In effect, the model embraces the fact that there are at least six other core fields to consider for corporate strategy to create better chances for success. The model thus signals a call for civil engineers to embrace a broader perspective in strategic planning.

Table IV Interactions of variables – contrast between Skanska and Philipp Holzmann

Strategic fields/ organization mechanisms	Descriptions	Comments
Philipp Holzmann (PH)		
Business strategy	Large proportion of businesses concentrated in domestic market (up to 62 percent of total revenue in 1997) Highly diversified in many vertical markets Pursue high risk, high growth ventures in 1990s, such as private financing schemes, offering long-term contracts in real estate development business	A lack of fit among these strategic fields/internal mechanisms seems apparent. Prolonged recession in domestic market in Germany calls for geographical diversification. PH's structure is complex, domestically rooted, and not streamlined to support such business strategy. The lack of liquidity and high leverage does not warrant the pursuits of high risk business ventures as described in PH's business and financial strategies. Moreover, PH's traditional culture is founded on technical aspects of engineering and construction – the firm is not prepared to take on and manage the economic risks of high growth businesses over the relatively short period of strategy transition
Financial strategy	Pursue volume growth at any price, leading to emphasis on major projects/contracts Take on rental guarantees and provide preliminary financing in real estate development Low liquidity coupled with high leverage (long-term debt-to-capital ratio of 0.63 over period 1997-2000)	
Structure	A hybrid structure that consists of: Geography – five regional divisions in Germany; PH USA Inc. overseeing US operations; PH Int'l Ltd. overseeing rest of world; European businesses are largely managed by subsidiaries in each country Market – separate divisions for specialized sectors such as prefabrication, road works, infrastructure projects, facility management Function – firm-wide engineering activities	
Culture	Traditionally founded on entrepreneurial spirit and technical realization of construction projects	
Skanska		
Business strategy	Growth through acquisitions of companies with strong fundamentals (such as market position, management team, reputation) but lack of financial resources to diversify across markets and countries Blending into local operating environment through such acquisitions, consolidating functions across various subsidiaries wherever appropriate over time	Interactions among fields/mechanisms are more prominent in Skanska's case. Strong financial health allows pursuit of more aggressive acquisitions, risks are closely monitored, its growth strategy is also sustained by asset management at portfolio level – all being positive interactions between business and financial strategies. Furthermore, Skanska's overall structure is streamlined to suit its business strategies: primary geographical setting allows managing acquisitive growth at different places/varying pace; secondary market segments for areas that can be consolidated, or country divisions to suit local conditions; separate market settings for areas with different operational/risk characteristics such as BOT, real estate
Financial strategy	Risk assessment/hedging strategies developed in line operations with first-hand information on operational risks Skanska actively manages its portfolio and divest non-core assets even when they are profitable to free up resources for investment in expansion of core business High liquidity coupled with low leverage (long-term debt-to-capital ratio of 0.20 over period 1997-2000)	
Structure	Geographical regions as primary layer (Skanska Sweden, Skanska Europe and Skanska USA) Market segments as second level structure (e.g. residential, commercial, road works, bridges under Skanska Sweden) Countries as second level structure (e.g. Denmark, Finland, Norway under Skanska Europe) Primary market segment structures also exist for BOT projects, project development and real estate	

Second, the perception of strategic fields, such as marketing, finance and human resource management, should be broadened. It is important to realize that these fields are not mere functions, but full-fledged disciplines with their own developments. Staying abreast of concurrent developments and discovering methods to selectively transfer tools and concepts from these

disciplines will significantly benefit strategic management in construction.

Third, a dynamic model is required to deal with changes, and this refutes a “step-by-step” planning approach or a “closed-form” model. By definition, the structure of the conceptual model proposed in this paper is dynamic since it identifies fundamental building blocks (the seven strategic

fields and two internal mechanisms) and treats them as variables. The interaction between these internal variables and the external environment also drives the “fluidity” of firm boundary – another form of dynamism.

Putting all these together, cultivating success factors and evading pitfalls can be handled concurrently in a coherent manner. Overall, the philosophical construct of the conceptual model must be emphasized the most. A major shortcoming of many strategic planning models is their specificity, which can result in the choice of inappropriate approaches to solve the problem in the first place. Since strategic thinkers perceive events differently and companies routinely confront unique situations, a focus upon applicable general principles, as in this model, is arguably more powerful.

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