

# **A PROJECT-BASED VIEW OF THE LINK BETWEEN STRATEGY, STRUCTURE AND LEAN CONSTRUCTION**

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## **ABSTRACT**

Currently, there is a good understanding that companies do not obtain satisfactory results when lean practices are implemented alone. The benefits can only be realized by making a substantial number of organizational changes, which in turn need to be coherent with the business strategy. However, contextual factors drive companies to adopt different business strategies, organizational structures and bundles of production practices. Consequently, the sequence and content of business development projects aimed to implement and test lean construction practices can vary according to each firm's internal characteristics and conjunctural needs.

This paper argues that lean implementation is not an isolated event, but part of an effort to create a strategy-structure alignment. Moreover, because lean implementation is conducted through different internal projects, it is also argued that projects constitute the link between business strategy, organizational structure and lean processes. A model is proposed to explain the role that projects play in interlinking strategy, structure and processes. In doing so, the authors hope to bring awareness to the bigger changes behind lean implementation and to the challenges of building "finely-tuned" organizations for specific missions.

## **KEY WORDS**

Project-based view, organization structure, lean implementation.

## **INTRODUCTION**

Contextual factors drive companies to find multiple, equally effective ways to compete within a particular industry. However, in free-market economies, the top competitors in each market sector are the organizations showing the best environmental and internal fit (e.g., Christiansen et al. 2003). Such companies are aware of the tangible and intangible attributes that impact the workings of a production system and the emergence of its competences. Consequently, they are cautious in aligning strategic choices in production strategy with one another and with those in other functional strategies. Coherence between subsystems is recognized as necessary to make the bigger system capable of supporting the business strategy.

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Differently, there is a lack of understanding by top managers of construction firms that, in any context, the development of a successful production system is the result of not one but many internal adjustments in the content of production strategy. This seems to be the root cause of the difficulties to implement lean practices in construction firms. The focus of such initiatives has been primarily on the tools of best-in-class production models and not much on the supporting underlying principles and strategic choices.

The recognition of this problem has led the authors to explore the myriad of factors that affect the performance of production systems and best practice development. The discussion presented in this paper is supported by a literature review on best practice implementation and by the authors' personal experiences with the topic. Besides bringing awareness to the challenge of shaping organizations for specific missions, the objective is to present lean implementation as the result of internal adjustments carried out in the form of business development projects. A model is proposed to explain the role that projects play in interlinking strategy, structure and lean processes.

### **THE NEED FOR CHANGE AT ALL LEVELS**

A production model is the result of a combination between strategic choices, non-intentional processes and various internal and external constraints. Therefore, companies have only partial control over the emergence of production models (e.g., Boyer and Freyssenet 2000). But even the aspects supposedly under control can be quite confusing and misused.

To begin with, there is no generally accepted definition of production strategy (e.g., Acur et al. 2003). In industrial management literature, researchers agree that it involves the identification of competitive criteria that should be prioritized, based on a balance between business strategy and internal competences (e.g., Voss 1995, Acur et al. 2003). They also agree that it encompasses a number of key strategic choices such as vertical or horizontal integration, capacity, workforce, technology, facilities and organization. It is understood that there needs to be a relationship between these two aspects because the assurance of environmental and internal fit is a pre requisite to good performance. In other words, the competitive criteria serve as a reference to strategic choices in production strategy, that need to be aligned with one another and with other functional strategies in order to make the whole organization capable of supporting the business strategy (e.g., Wheelright 1984).

### **DISTINGUISHING BETWEEN STRUCTURAL AND INFRASTRUCTURAL STRATEGIC CHOICES**

In an attempt to clarify the decisions that directly affect production system design, Wheelright (1984) proposed that the key decision areas in production strategy be split into two sets of strategic choices. One set relates to structural decisions, such as resource capacity, facilities, machines, and technologies to be used. In manufacturing, these decisions create the physical part of the production system design and are usually seen as onerous, long-term and difficult to reverse (e.g., Barros Neto 2002). The other set relates to infrastructural decisions, like relationship with suppliers, managerial philosophy, production planning and control, workforce management, quality control and so on. These are less obvious decisions and are behind the creation

of intangible capabilities and competences that cannot be copied by the competition (e.g., Hitt et al. 2003). The two categories are the most commonly accepted in industrial management literature.

In the context of construction, in general, attention is mostly given to the set of structural decisions relating to facilities, resource capacity, and technologies. The other set has been usually taken for granted or has been mainly limited to misaligned initiatives at the level of operations. Therefore, the traditional development of project production systems has been very much limited to the physical aspects of the construction phase. The concern with these structural aspects of the production system has a direct relation to construction peculiarities. Not only there is the influence of site production, but also of the product's one of a kind design, location and specificities.

### **DIFFICULTIES IN ALIGNING STRUCTURAL WITH INFRASTRUCTURAL STRATEGIC CHOICES**

Infrastructural decisions seem to be the least understood aspects of production models. When analysing the content of production strategy, Harris (1997) reported the existence of interactions between strategic, tactical and operational factors. The author argued that consistent decisions at all three levels would give returns over and above the benefits obtained from particular levels of any one factor. However, academics have difficulty in capturing all the strategic choices and even the underlying rationale used by decision-makers when structuring organizations to support business strategies. Practitioners offer little help, since few put effort into analysing why they do what they do.

A good example is the relationship between strategic choices in production strategy and production practices implemented at the level of operations. Voss (1995) mentions the link between strategic choice and "best practice" implementation projects, such as Just-in-Time (JIT) and Total Quality Management (TQM), as being quite unclear. Not only there is little information on the infrastructural strategic choices needed to support the practices, the reasons to why they are chosen and how they align are usually not explicit. The poor understanding causes doubt on the efficacy of fundamentals and subsequent decisions. The only certainty, however, is that the strategic choices in production strategy and the production practices effectively implemented or developed internally by top competitors are in some way aligned with one another and with the companies' business strategies.

### **IMPLICATIONS FOR BEST PRACTICE DEVELOPMENT**

A further discussion on the challenges of "best practice" implementation offers a more comprehensive view of the problem. For instance, if a "best practice" implementation project is conducted alone, the company may not obtain satisfactory results. First, as discussed by Voss (1995), a "best practice" will not by itself guarantee improved performance because it cannot solve all problems. Second, "best practices" usually come in small isolated pieces. Third, their most obvious characteristics can be easily imitable. Therefore, they are unlikely to give sustainable competitive advantage. But even worse, some may only bring the best results under certain circumstances or are applicable only in specific contexts. And like other aspects of functional strategies, they may not be relevant for all companies. In fact,

some production practices may be of interest and even appropriate only to firms following a similar strategic orientation and sharing the same geographic area. Thus, firms emphasize the implementation of different bundles of production practices, obtaining different operational performance (e.g., Christiansen et al. 2003).

This shows that regardless of what many consultants like to say, a “best practice” is not a technique that can be easily taught and transplanted from one industrial or market environment to another. On the contrary, similarly to other aspects of production models, true best practices are the final results of the combination between contextual factors and organizational arrangements. It must be understood that “best practice” is what the best performing companies do within their market sectors. Thus, the implementation of a successful production practice in a new context requires an organization to recreate and match the main strategic choices that have made it so effective in the original environment. But even this may not be enough, as there are many other external and internal factors that are not fully understood nor replicable. It is difficult to understand the implications of individual or combined strategies on project performance in a dynamic environment like the construction sector. This explains why some best practices fail to provide the alleged positive results. For example, Alarcón et al. (2005) perceived organizational aspects to be one of the main barriers to the more complete implementation of the Last Planner System and other lean construction practices. Mohan and Iyer (2005) have also presented results showing a small amount of lean principles and practices effectively used in construction companies and an even smaller amount of major benefits realized.

The discussion points to the need of critically perceiving the various internal and external contextual factors that may hinder an organization from satisfactorily applying certain practices or developing competences. It also serves as a reminder to the construction sector for a better understanding of underlying strategies and their impact on the emergence of production models. As discussed by Barney and Zajac (1994), the competitive consequences of resources, capabilities and competences cannot be understood independent of the strategic and competitive context within which a firm is operating.

Under the existing contingency factors, like any other successful organization, effective project-based organizations should not only seek a proper fit with the surrounding environment, but also between its subsystems. Although challenging, the strategic choices in production strategy, be they structural or infrastructural, must be aligned with one another and with the decisions in other functional strategies like marketing, financial and human resources. There must be horizontal coherence inside and among functional strategies in order to support the vertical coherence with business and corporative strategies.

## **THE IMPORTANCE OF UNDERSTANDING THE CONTENT AND PROCESS TO MAKE THE CHANGE**

The existing top competitors in each market sector are most likely to be organizations showing the best environmental and internal fit. In accordance with Ballard et al. (2001), the production systems in these firms have been successfully designed to achieve the purposes of both their costumers and those who deliver the system, the producers. Such organizations were capable of strategically making changes to reduce the external and internal constraints that kept them from attaining better results (e.g.,

Blackstone 2001). They have learned that, despite the biggest barriers being in the market place, many problems can be relatively well surpassed through the revision of different functional strategies and decisions in production strategy.

But the way top competitors find different, effective designs to achieve the same customer needs within a particular industry is poorly understood. A route to better comprehending the production strategy is by looking at it from two perspectives: content and process (e.g., Acur et al. 2003). The content of production strategy comprises the specific key decisions which set the production system's competitive criteria and structural and infrastructural aspects. As for the process of production strategy, it is defined as the method to make the specific content decisions that originate the production system. The focus on the content is concerned with what the organization is going to compete while the focus on the process is on how the production strategy is developed. Both perspectives are perceived to be interrelated because some aspects of the content can only be clarified by understanding the process of production strategy.

The process of production strategy has been the subject of many academic debates and has even lead to the proposition of heuristics, principles and methodologies. Porter (1980) proposed a top-down approach where the implementation of functional strategies, including the production strategy, should begin with the analysis of the five competitive forces in the market. Oppositely, Wernerfelt (1984) proposed a bottom-up approach where the formulation of strategies should depend on the organization's resources, capabilities and core competences. Nowadays it is commonly agreed that the two approaches are complementary. There is strong evidence that both strategy and competences influence each other (Hansen et al, 1997).

It is important to notice that because the need for a change can only be justified by external pressures, the top-down approach, with competitive criteria driving business development projects, is in fact stronger. Acur et al. (2003) found results corroborating that it is apparently easier for business and marketing goals to influence production than the other way around. The authors also observed that if a formalized production strategy is present it is more likely that the firm has employed a top down than a bottom-up approach in the design of the strategy. These aspects explain why the changes in production system design to support the competitive criteria are primarily concerned with the effectiveness of the chosen solutions and secondly with their efficiency. Following the firm's directives, the production system is initially designed to meet the costumer's expectations and only thereafter to look for ways to eliminate waste in processes. This leaves no doubt that production is a secondary consideration in strategy formulation and a derivative of business strategy.

Even so, it cannot be ignored that the alignment between competitive criteria and business development projects may actually work both ways, with competitive priorities driving key decision areas and development projects, but projects and competences limiting priorities (Acur et al. 2003). This two-way communication is best explained by Hitt et al. (2003), who affirm that although the strategy influences the structure, it is the effective alignment between the organization's tangible (i.e., facilities and machines) and intangible (i.e., people's skills and procedures) assets that facilitates the implementation of strategies. To summarize, there is a constant effort in balancing what needs to be done with what actually can be done.

## **THE ROLE OF PROJECTS DURING THE CHANGE**

The link between business strategy, structure and performance is a classical theme in strategic management literature, with the main thesis being that organization strategy determines organizational structure, which in turn influences organizational processes and competences (e.g., Prajogo and Sohal 2006). The organizational performance is the result of their alignment. However, to fully understand this conceptual model it is necessary to acknowledge project management as the aspect of business dynamics that turns vision into results. The reason lies in the fact that projects guide the change in the strategic direction of the organization or the business process to address the costumers' needs. Therefore, project management should be seen as the point of departure to managing the change towards lean construction. The discussion in this section aims to enhance the conceptual model by clarifying the relationship between projects, strategy, structure and lean processes.

## **FUNDAMENTAL CHARACTERISTICS OF PROJECTS**

As mentioned by Ballard and Howell (2003), designing and making something for the first time is done through a project. Thus, a project is essentially a one-off undertaking to fulfil predetermined specific goals, within the constraints of budget, time and acceptable performance standards (e.g., Lim and Yeo 1995).

Because projects aim at solving relatively complex and unique problems within distinct start and end points, temporary organizations need to be established for a limited period of time. Even the simplest projects are installed as distinct organizational units to the base organization and receive from it an appropriate amount of resources and personnel to accomplish specific objectives. As expected, the rigid departmental structure and the formal communication lines are made less important as the people involved belong to both the project and departments. The project team becomes an entity that crosses the departmental boundaries with its own budget, division of work and performance goals. In this sense, the project approach creates less hierarchical and more flexible organizations inside the base organization. This enables the base organization to undertake missions outside the scope of its ongoing operations.

The number of people and of internal hierarchic layers can vary depending on the project. The project organization can be composed of a single person from a functional unit, a group of individuals from one or more departments or even teams from different firms. This diversity in the number of participants can be seen among many types of project-based production systems (e.g., Ballard and Howell 2003).

## **FUNDAMENTAL DIFFERENCES BETWEEN PROJECTS**

Due to the different possible objectives, projects can be categorized into internal and external projects. The fundamental difference between the two types is that internal projects do not have any external stakeholder while external projects have external stakeholders i.e. the costumers (e.g., Lim and Yeo 1995). The internal projects are applied to business development. These projects serve to improve the firm's overall efficiency and to create more value in the product or services delivered to the costumers. Successful internal projects improve the performance of the company in terms of financial returns as well as market share. Differently, external projects are

applied to industrial development. These projects usually involve the production of a specific service or product. According to Martucci (1990), their specific goals are influenced by two distinct costumers: the final costumer in the marketplace (the buyer) and the organization that is sponsoring it (the developer).

Furthermore, projects can be operational, tactical and strategic in nature depending on whether the consequential impacts as short-term, mid-term or long-term. According to Lim and Yeo (1995), strategic level projects can be all-encompassing in nature, which might include some or all of the following four types of projects: (a) improvement projects; (b) development projects; (c) product-based projects; and (d) manufacturing structure and infrastructure projects.

A project can be a vehicle for achieving change outside the existing functional structures and hierarchies. In other words, it can be done to fulfil objectives without necessarily bringing changes to the base organization. This is the case of external projects. These are temporary undertakings aimed to successfully deliver a product that meets customer-driven performance specification, on schedule and within the development budget so as to satisfy the corporate business and profit plans. Effective project management meets these interlocked objectives, which form the basic triple constraints in this type of project.

Examples of external projects at the work level abound. In a job shop production system, jobs to manufacture customized products can be considered operational projects. The same can be said about a batch type of production system, where the customisation of the process flow for particular customers is in itself an operational project. These projects do not cause any relevant change in aspects internal to the base organization. On the contrary, they are supported by the existing structure.

But there are situations that do require internal adjustments to effectively perform an external project. This is the case of new product developments, which can be described as tactical projects in whatever type of production systems. To bring products from concepts to the marketplace, project management will usually involve a multifunctional team in the product development process. Depending on the product and the capabilities required to develop it, the project implementation may use one's own staff or the contractor's staff. Moreover, human resources may be needed in a more dedicated team to work full-time on one project at a time. Civil construction projects fit into this category.

The match between mission, structure and processes generates customized formal development processes within the main project phases, e.g. pre-design, design, procurement and installation. This is the case with construction firms that specialize in specific types of projects. Industrial development projects such as power stations, bridges, dams, and production plants, to name only some, are examples of large-scale product developments often operated with customized development processes.

However, more profound adjustments are needed if changes occur in the original scope of activities or performance requirements. The organization will need to reconfigure its structure to finely support the goals reflected by the new strategic orientation. This is when internal projects become necessary.

Internal projects can be strategic, tactical or operational in nature because requests to improve or even to change working processes may come from management, staff and marketplace. Each request turned into a project needs to correctly and unambiguously define the measurable end goal and beneficial change of the project.

The reason lies in the fact that although a business development project is installed as a distinct organizational unit to the base organization, it should provide results that are in one way or the other integrated into the overall company's strategy (e.g., Van Der Merwe 2002). Therefore, attention is needed when restructuring existing aspects internal to the organization so that the results support and align changes in both strategy and business processes.

The construction sector provides examples of internal projects that are all-encompassing in nature. This is the case of projects aimed at operational expansions such as plant relocation to another area or commitment to a greater number of construction projects. Such projects are strategic in nature because they derive from the projected growth in product demand and their life cycle is relatively longer. To undertake a range of new large-scale projects a construction firm will need to modify its structure. The investment requires huge capital outlay to hire qualified personnel, acquire major equipment, extend quality management systems etc. Because of the heavy investment involved, an operational expansions project must have its financial viability critically analysed. Factors like market for products, selling price, cost of raw materials and labour, government's policies and etc. are taken into account during the project definition phase.

## **THE STRATEGIC NATURE OF LEAN IMPLEMENTATION**

The above discussion on project characteristics highlights the interdependence between internal and external projects, regardless of them being operational, tactical or strategic in nature. It has become clear that internal projects are the tools that help firms transform strategic decisions into systemic capabilities and competences. Complementarily, firms use external projects to exercise their competences. This leads to the observation that an adequate analysis of lean implementation in construction firms must encompass the project-based view, since it is crucial to aligning strategy, structure and performance. Hence, a conceptual model is proposed with projects being fundamental to the process of production strategy (Figure 1).

As discussed before, strategic choices in production strategy need to be aligned with one another and with other functional strategies in order to make the organization capable of supporting the business strategy. Thus, the development of lean construction is an internal project that is all-encompassing in nature. The principle of Kaizen is a lean pillar that requires a firm to be constantly challenging the status quo and norms of doing business as well as increasing operational efficiency. Hence, improvement efforts should cover various functional strategies, especially structural and infrastructural decisions in production strategy. The goals specified in the upper-level policy deployment must be translated into tactical goals by the middle managers. These in turn need to be deployed down to the level of operations as sub-goals.

The idea is to start small and gain experience gradually (e.g., Arbulu e Zabelle (2006). This should be done without forgetting that the contribution of each project should not be in a fragmented manner, but driven by the "total programme" strategy. Therefore, the implementation of lean construction is strategic in nature and requires a total system approach since it involves various levels of plans. The change must encompass the firm's current activities, business practices, policies, resources and capabilities, because they all affect firm performance (e.g., Ray et al. 2004). Hence, it

is a long term business level programme represented by a series of projects, which can be developmental, improvement, structural and infrastructural.

Consequently, lean implementation is a type of internal project that requires great investments and has long term consequential impacts. As mentioned by Acur et al. (2003), four years is the length of time generally necessary for a company to be able to assess the results of introducing a new strategy. Hence, the duration and cost of such an internal project result from the various smaller projects driven by strategic choices. The duration of each project can be in days or weeks when it is operational in nature. In such cases, very often the costs incurred are in terms of allocated labour man hours. But in some cases there is money spent on capital equipment.

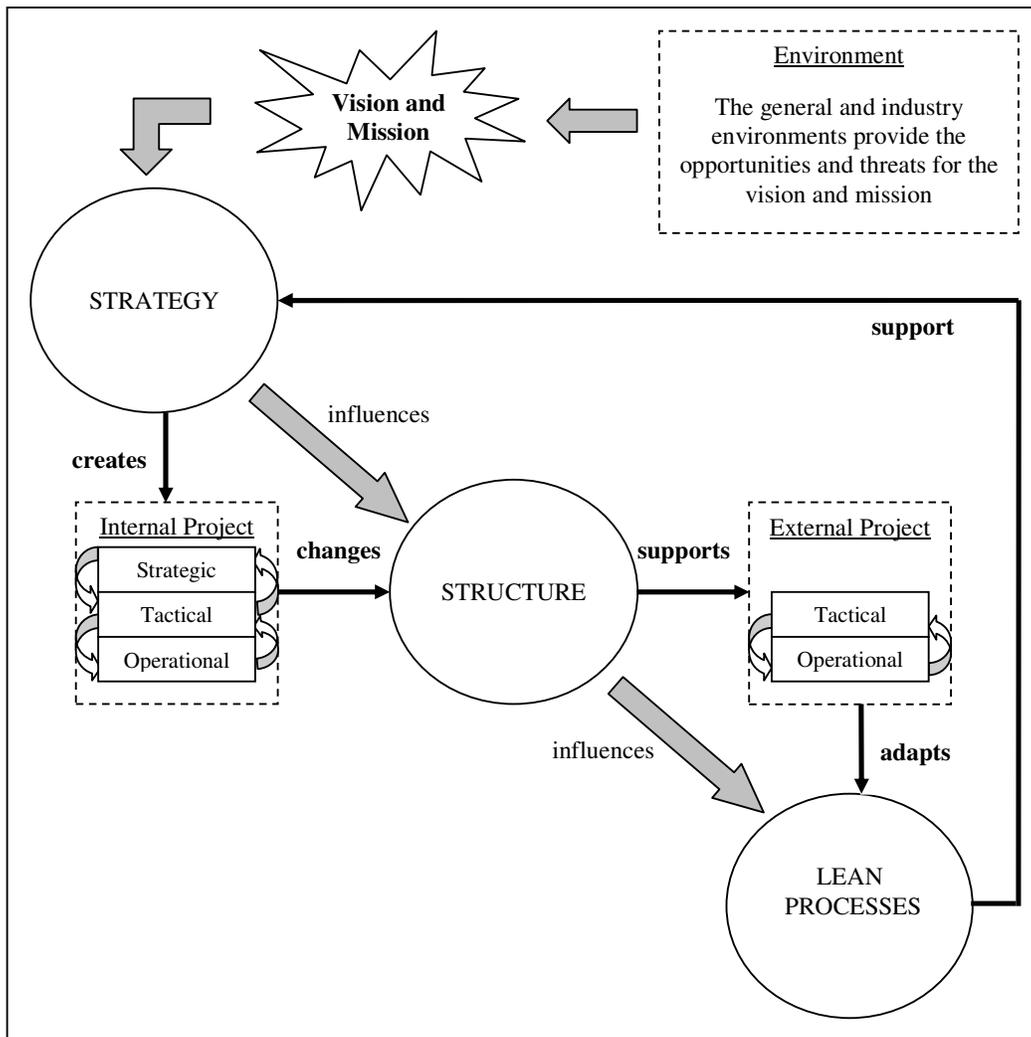


Figure 2: The Relationship between Strategy, Structure, Lean Processes, Internal Projects and External Projects.

## CONCLUSIONS

This research effort describes classical ideas on business strategy, its content and process and the well accepted hierarchy dictating that structure and performance follow top management decisions. However, there are many shortcomings in theoretical developments and practical applications. Hence, it seems unrealistic to propose a well established and tested set of guidelines on how to align managerial decision-making with business strategy. Despite that it is maintained that what is already known suffices to guide efforts towards lean processes implementation.

In order to pursue this undertaking, a clear distinction should be done between internal and external projects. According to the model herein presented internal projects free the organization from external stakeholder pressures, providing time and budget to prepare the business for future endeavours. Claims for immediate improved performance are postponed and translated into possibilities of sustained better results in the future through an enhanced organization.

The apparently protected environment provided by internal projects does not make it simpler to implement the infrastructural decisions needed to foster lean processes. It is argued that by nature, lean processes are supported by encompassing principles and changes that make it mandatory to have a systemic view on organization development. Further to that, any lean implementation should address structural decisions like the ones related to facilities, resource capabilities and technology, as well as their relationship to other infrastructural decisions.

The implementation effort ahead is still more defiant as it is argued that internal projects should be more strategic (long term) than has been the case in most operational (short term) examples put forward in lean construction literature. This broader view should provide firms with the missing links to improve business performance and thereby enhance the capability to undertake external projects.

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