

# Innovation as a Structural Attribute of Company Competitiveness

Oswaldo Luiz Agostinho

School of Mechanical Engineering – FEM, University of Campinas , UNICAMP

Campinas, SP, Brazil

e-mail : agostinh@fem.unicamp.br

**Abstract**-Innovation does not occur spontaneously in an organization. Instead, structural conditions providing methodological support to the innovation process must be established, thereby ensuring the competitive edge required to respond to market demands. Organizations should therefore be designed with attributes, i.e., internal characteristics that provide structural conditions aimed at meeting these external demands. This paper aims to characterize the innovation process as one of the structural attributes of company competitiveness. Innovation, which is considered an attribute aimed at meeting customer needs, is shown to be a prerequisite for organizations to gain a competitive edge in the market. The methodology adopted here consists of identifying the structural attributes of the organization, being innovation one of them, establishing the conditions required for the innovation process to prosper. Sub attributes that support the innovation attributes are presented and linked to the innovation process. The main result is a model that considers the cause-and-effect relationship between external demands and the structural attributes of innovation, providing methodological support for innovation processes, enabling companies to meet the needs of competitiveness in their market segment. This model facilitates the design of innovation characteristics, creating guidelines for the company's strategic positioning in its market segment. This approach, linking concepts of competitiveness and innovation , is not usual in the existing literature and business practices . The limitation of this research is mainly the design of this generic model for the specific organization application.

**Keywords**-Innovation; organization attributes; competitiveness; business models.

## I. INTRODUCTION

Competitiveness is a critical success factor for organizational survival in the turbulent 21<sup>st</sup> century. Competitiveness can be understood as a company's ability to continuously review its competition strategies in order to gain a favorable position in its market segment. It is triggered in response to external pressures resulting from the demands of market, science and technology and society, which are the main actors of the external environment. These demands are expressed through continuous and intermittent stimuli produced by these actors, e.g., shorter product life cycles, increasing product diversification, reduction of time to market, rapid obsolescence of existing products and organizations, swift emergence of new products, and the need to update the knowledge base. These

factors exert different levels of influence, according to their geographic location (county or municipality, state, region, country, or continent) and economic activity (health, education, durable or non-durable consumer goods, capital goods, etc.) [3][10][12]

Company competitiveness means that the organization's working conditions enable it to generate higher than average profits in its market segment, operating sustainably, with quality, speed and flexibility. Moreover, the organization must satisfy stakeholders and comply with environmental requirements. Competiveness can be divided into External competitiveness, which means the company has the ability to persuade consumers to buy its products rather than those of its competitors – in other words, the ability to shift the consumer's brand loyalty. External competitiveness is calibrated and controlled by qualitative standards. This ability, in turn, drives so-called Structural competitiveness, which is seen as a set of harmonious and synergic methodological and technological factors that induce the external market to shift its product loyalty from the brand it previously purchased to the new one. Structural competitiveness, which is calibrated and controlled by quantitative standards, is achieved through the use of structural attributes. Figure 1 shows a schematic diagram of the competitiveness model, identifying the actions of each of its components and their respective relationships [1].

This paper is structured with the following sequence :I- Introduction: This section presents the more wide concepts like Competitiveness and its influence in the organization structure ;II – Structural attributes presents the concept of Structural competitiveness , its quantitative standards and the relationship with qualitative standards, and characteristic of the external competitiveness main attributes; III – Innovation : this section provides the Innovation definitions , its classification and the its respective sub attributes, information flow needed for innovation; IV-Relationship between innovation and other structural attributes: this section establish the relationship between innovation and the other structural attributes as Organization driven attributes and Human capital driven attributes; Conclusion and future work: this section presents the main conclusions and the proposed future works.

## II. STRUCTURAL ATTRIBUTES

This section presents the competitiveness model, showing the concepts in the external environment and the organization environment; it also presents the relationship between the external and organization environment.

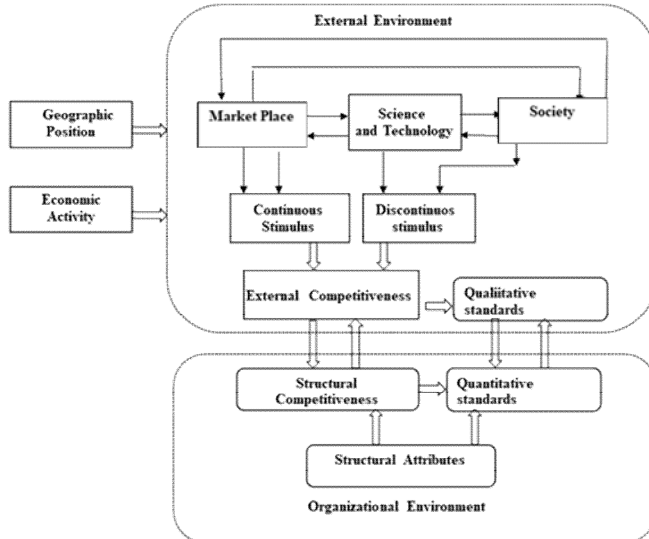


Figure 1. Competitiveness model

Companies achieve structural competitiveness as a result of their market, organizational and human capital management structures. These are defined as *structural attributes*, which are characteristics of the management system, manifested by ongoing practices composed of methods that make up the organizational and technological management. The attributes and subattributes of competitiveness are classified according to the range of applications described below.

### A. Market driven attributes:

Characteristics inherent to the organization’s management system, expressed by an ongoing, comprehensive and integrated set of methods aimed at providing the conditions required to meet consumer market demands. Market driven attributes can be divided into the following subattributes:

1) *Innovation* - The process of technological innovation consists of a complex set of activities that transforms ideas and scientific knowledge into physical products employed in the real world [5][12]. Innovation also comprises existing technology and inventions to create a new product, service or process. Innovative companies search for all kinds of ideas, and their organizational culture encourages the development of these ideas into feasible business programs. The subattributes of innovation can be divided as follows: a) focus on consumer needs; b) enterprise-wide quality; c) enterprise-wide planning; d) use of core knowledge; and e) continuous upgrading of products and processes.

2) *Agility* - An agile company is one whose technological and administrative infrastructures are flexible and can be rapidly created, set up, and rearranged to meet external business needs. Among other things, this attribute favors faster time to market of new business initiatives. The subattribute of agility can be divided into: a) technological independence; b) reuse of solutions; c) suitable business infrastructure; d) system-wide response capacity, not just of individual processes; e) existence and implementation of strategies; and f) enterprise-wide business architecture, including supply chain and marketing processes.

3) *Responsiveness* - An organization’s ability to respond to market demands in a timely manner, also called “time to market.” This ability includes proactive search for customer and supplier feedback, fast cycle organization, flexible thinking, and doing things in short periods of time. The subattributes of responsiveness can be divided into: a) business process optimization, with the elimination of activities that do not add value to the product or business; b) adoption of proven technology; c) integration of business strategies; e) fast response time from Engineering and Marketing processes; and f) supply chain network optimization.

### B. Organization driven attributes

Characteristics inherent to the organization’s management system, which are indicated by ongoing, comprehensive and integrated methods aimed at providing favorable conditions for its organizational structures to meet external needs. Organization driven attributes determine how the business administration and management process is applied throughout the organization. These attributes can be divided into: a) information flow synergy; b) structural integration; c) information infrastructure; and d) knowledge management.

### C. Human capital driven attributes

Characteristics inherent to the organization management system expressed by a continuous, comprehensive and integrated set of methods aimed at providing favorable conditions for the development of selection, education, and training programs that enable the organization to reach the level of human capital needed to support its competitiveness. Human capital driven attributes can be divided into: a) Teamwork design; b) project clusters; c) virtual teams; d) human networking; and e) assumption-to-knowledge ratio.

It can be stated that a company’s structural attributes enable it to be organized, resulting in a state of structural competitiveness that should be unambiguously aligned with external competitiveness. To reinforce this mindset, the organization must have internally structured attributes whose implementation enables the company to meet the demands of external competitiveness in response to continuous and intermittent stimuli. Given the limited scope

of this article, however, our discussion will focus solely on the innovation-related portion of the complete competitiveness model.

Figure 2 schematizes the attributes and subattributes of competitiveness, split in market driven, organization driven and human capital driven.

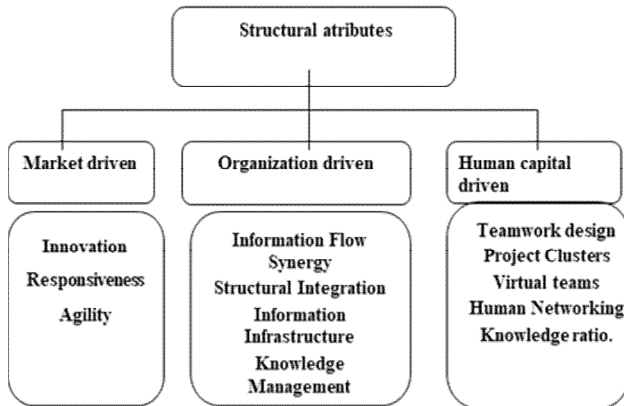


Figure 2. Structural attributes

### III. INNOVATION

Any discussion about innovation must include the subject of technology and their interrelatedness [5]. Technology involves the design, production and distribution of goods and services in response to market needs. Invention, on the other hand, is limited to expressing a new idea, a new concept, or sketching a new path without considering real technical or market feasibility. Hence, innovation bridges the gap between ideas and their actual implementation to meet human needs. There is a natural link between technology and innovation. Technology is improved continuously through a flow of incremental innovations that build and shape its course.

Before discussing structural aspects, some concepts of innovation will briefly be reviewed [14]. Innovation involves the creation of a product, service or process that is new to an organization. It is introduced on the market through the use or sale of a new product, service or process. Innovation can also be defined as the creation of something new. It does not have to be new to the world; rather, it is seen as the first use of an Idea within an organization, whether or not this Idea has been adopted by other organizations. The technology (or product) must be novel or ground-breaking. An innovation may be a change in an industrial practice, which improves productivity. The innovation process involves integrating existing technology and inventions to create a new or improved product, process, or system. Although invention and innovation are closely related, they are not the same thing. An invention can be considered an event, while an innovation can be thought of as a process. Innovation is less common, while

an invention usually precedes several innovations. Innovation represents the important link between an Idea and its exploitation or commercialization. The bottom line of innovation is the market, which will buy it or ignore it, thereby dictating its success or failure. The relationship between innovation and the need of competitiveness is a partially solved task. This paper intends to identify a significant, challenging, not yet solved, relationship, and propose the way to reach it

#### A. Classification of Innovation

Innovation can be classified as radical or revolutionary, or as incremental or evolutionary. Radical breakthrough innovations are usually based on inventions. They are relatively rare and typically start outside the boundaries of a firm. When such innovations are developed within the boundaries of a firm, they signify the introduction of something that is not only new to the organization but also drastically different from existing practices. An example of radical innovation is the substitution of chemical photographic processing for computational photography.

The second category, which comprises incremental or evolutionary innovations, involves small but important improvements in a product, process, or service. Incremental innovations are relatively common and are created in-house, helping companies maintain their competitive edge in the market. An example is the Kaizen method, a process of continuous improvement which is typical of this type of incremental innovation.

Routine innovation is another category occasionally used to refer to the introduction of something new, albeit very similar to what an organization had in the past. An example of this is the redesign of an item for a new one in the manufacturing operation of a product component.

#### B. Innovation as a structural market driven attribute

As Figure 2 indicates, innovation is a market driven structural attribute. This means that, for an innovation to be of interest to the business, it must be part of the concepts that underpin the company's management model and be included in its strategic issues and plans. Hence, it must be linked, via cause-effect relationships, to the various components of the business model. Considering the above described definitions and implementation of the concepts of innovation, they can be contextualized as a market attribute that is an integral part of the competitiveness model. Moreover, innovation can be classified as a structural attribute of the organization, whose aim is to satisfy customer needs.

#### C. Innovation subattributes

The innovation subattributes are characteristics of an organization that creates favorable structural conditions for the development of innovation processes [12][14].

### 1) *Focus on consumer needs*

Meeting the requirements of this subattribute involves changing an organizational culture that is often deeply embedded. Such changes consist of: i) shifting from an internal and often functional approach to a customer-oriented matrix management system; and ii) searching for customer input about products and services and remaining constantly attentive to ensure that this input is communicated throughout the organization instead of only to marketing and Research and Development staff. Several surveys have revealed that most of the development of new ideas and products comes from listening carefully and working with clients, rather than from new ideas for developing new products created separately in Research and Development laboratories. Hence, innovation efforts should preferably be aimed at meeting customer needs.

### 2) *Enterprise-wide quality*

The cost of entry for companies in the 21<sup>st</sup> century is the highest possible quality. To this, they end, will have to adopt the broadest possible vision of quality. The concept of total customer satisfaction must be a goal. The company's entire management team must be fully committed to the zealous pursuit of this goal. This quality mindset must be applied to both the tangible and intangible services pertaining to the company's physical products. Quality has to do with how people focus on the customer, i.e., the next person in line responsible for the subsequent activity of the company's business processes (the internal customer) or the all-important end user. It is essential for customer supplier relationships to be established within each company's business process. The innovation process must be imbued with the company's quality concepts to ensure that its products and services meet customer needs and expectations with the highest possible level of quality.

### 3) *Enterprise-wide planning*

To ensure its success, the innovation process must be included in the full enterprise-wide planning at the various strategic, tactical and operational levels. In other words, the company must formulate innovation strategies, i.e., tactical plans for innovation originating from its innovation strategies, operational plans for innovation originating from its tactical plans, and specific projects originating from its operational plans. Large organizations have a natural tendency to create internal mechanisms that hinder innovation. It is a major strategic challenge to reduce as much as possible these mechanisms that favor operations, i.e., efficiency of current activities in detriment to creativity, idea generation and the launch of innovative projects. Innovation is initially seen as a disruption that interferes in the operations of existing activities. In traditional and conservative organizations, the difficulties arising from the introduction of a new software program (e.g., an ERP system), a new method (Group technology, Simultaneous Engineering), or a new organization model (Business Process Management), etc., are well known. Such

organizations were designed to last. Rational decision-making and operational pressures depend on many layers of reporting and control. This obviously tends to favor the amortization of heavy investments in existing activities. In this regard, organization and innovation are on opposite sides of managerial concerns. Companies need not only to operate but also to evolve. Hence, the inclusion of innovation processes among the company's issues, and thus, of innovation strategies in its long range strategic plan, is a high level decision that is usually made by the Board of Directors and conveyed as a top-down decision. Therefore, the company must be convinced, at the political and strategic level, that investing in innovation is a business decision resulting from the realization that it has to maintain and exceed its current competitive edge in order to satisfy customer needs and expectations.

### 4) *Use of core knowledge*

Regardless of their organizational structure, considerable duplication of efforts and management fragmentation are common issues in companies. In large companies, in particular, opportunities to achieve operational synergy are rare, since these companies tend to focus on purely financial aspects. Thus, it is essential to define core competencies, representing unique corporate capabilities, i.e., the company's "collective knowledge." Companies normally have only two or three core competencies. These core competencies and expertise should be defined by the strategic positioning of the company, which should allocate the corresponding funds. Moreover, top management should use the company's core knowledge as basis not only to build strategic alliances, but also to create sourcing and vertical integration strategies. Clearly, organizations must offer innovative products and services if they operate in external environments where product lifecycles decrease continuously and which are characterized by ever increasing product diversification and by the demand for products with highly differentiated functionalities and performance. In such organizations, innovation is essential for them to maintain their competitive advantage. Therefore, innovation must be part of the "collective learning" process, which is considered a core competency.

### 5) *Continuous upgrading of products and processes*

The process of ongoing improvement and of adapting to the environment of continuous change, ideas and plans that make up for continuous upgrading of processes and products is a constant demand. In this context, incremental and routine innovations in products and manufacturing processes, and the elimination of activities that add no value to the company's business processes are some examples of these innovative practices.

D. Innovation information Flow

The diagram in Figure 3 illustrates the company’s response to external demands for new products and services, and the reaction of its innovation process with new products and services. The external flow illustrates how the external environment activates the organization, calling for new products and/or services. Enterprise flow takes place in the opposite direction, reacting through the innovation flow or process by supplying the products or services required by society, science and technology or the market.

The attribute and subattributes of innovation, considered a market driven structural attribute, uses the external needs as input and develops new products and services, following the connections between its subattributes and other structural attributes, such as organization and human capital. These relationships between innovation and other structural attributes are discussed below. Figure 3 shows the information flow between the external environment and structural attributes, detailing this flow in the innovation process.

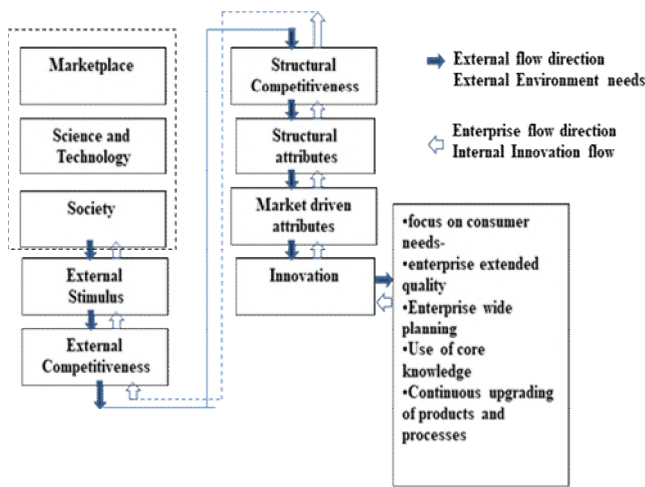


Figure 3. External environment and enterprise flow for innovation processes

IV. RELATIONSHIP BETWEEN INNOVATION AND OTHER STRUCTURAL ATTRIBUTES

The attribute of innovation depicted in Figure 2 is correlated with other structural attributes, as follows:

A. Organization driven attributes

Organization driven attributes determine how the business administration and management process is applied throughout the organization. The innovation process is supported by these attributes, so that its concepts and process activities can be applied continuously. Organization driven attributes are divided into the following subattributes. [1][12]

1) Information flow synergy

The company’s business processes, including its innovation process, should involve activities that add as much value as possible to the business.

2) Information infrastructure

The existence of a unified information system that includes most of the company’s business processes facilitates interactions between its innovation process and other business processes, such as product design, product manufacturing, marketing and sales, manufacturing planning and control, etc.

3) Knowledge management

The innovation process will be facilitated if is linked to the knowledge base required for selected technologies, internal developments, R&D partnerships or acquisitions.

4) Structural integration

The structural integration of the organization’s business processes enables the innovation process to be involved in the management of research activities, development feasibility studies, and more generally, in project management. Therefore, structural integration becomes part of the implementation and improvement of subsequent product and process technologies integrated in the company’s portfolio.

B. Human capital driven attributes

Like the company’s other processes, the innovation process is supported by the skills of human capital[17]. Ultimately, it is people that distinguish successful companies from those that fail to provide the means for their human resources to develop. People create and implement strategies, design information systems and make them work. Hence, it is obviously people that create inventions and develop innovations. However, for people to be differentiators, they must be educated and trained in a continuous learning environment. Education is only part of the solution. People can also be encouraged by performance related ideas and metrics, and empowered to get the job done. The creation of an innovative environment must follow the abovementioned parameters, with the added premise that an innovative product or service that fails when initially introduced on the market should not be considered a failure, but rather, an opportunity to review ideas and designs and use these reviews in the next innovative project. The structural sub attributes driven by human capital are as follows.

1) Teamwork design

The innovation process is facilitated and accelerated when people involved in innovation engage in teamwork, exchanging ideas and concepts without putting up self-protective barriers. Teamwork design is the opposite of peer-to-peer organization, which is a frequent feature in traditional organizations. The innovation process may be slower in peer-to-peer organizations because the top down

management style often hinders the free expression of creative minds.

2) *Virtual organization and virtual teams*

These subattributes are feasible when the information technology infrastructure enables knowledge to be exchanged through available networks, and innovation groups are formed in organizations located in geographically different regions or countries within the same extended enterprise [5][17].

Figure 4 illustrates the main relationships between innovation and the organization driven and human capital driven attributes. It shows the relationship between external environment, structural attributes, innovation and the organization driven and human driven attributes components.

V. CONCLUSION AND FUTURE WORK

Organizational competitiveness is essential for companies operating in their different fields of activity. In the turbulent environment of the 21<sup>st</sup> century, with product life cycles decreasing and product diversification increasing continuously, the demand for innovative products and services is growing apace.

Innovation does not come about spontaneously in organizations. In fact, the innovation process requires methodological support provided by structural conditions, which in turn must be tied to the competitive requirements manifested by external markets. This article discusses innovation as a process rather than as an event. Hence, it should be seen as an organizational process and included as a structural market driven attribute in the competitiveness model. In this proposal, the sub attributes of the innovation process are presented as the basis for its development and ongoing feasibility. The logical connection of innovation sub attributes to the organizational and human capital driven, internal attributes of competitiveness (Figure 4), and actors of the external environment (Figure 3) is considered understandable and feasible solution to connect Innovation with external Competitiveness, as proposed in Figure 3. Nevertheless, this process should be supported by other organization driven and capital driven structural attributes as well. The various workflows that comprise the innovation process as part of the competitiveness model are presented in this paper by means of cause-effect relationships between external requirements and the structural attributes of innovation. As proposed, a logical relationship was developed between the innovation process as market driven attribute and its competitiveness, necessary to the company survival in the third millennium. This approach is presented through a model that considers the cause-and-effect relationship between external demands and the structural attributes of innovation.

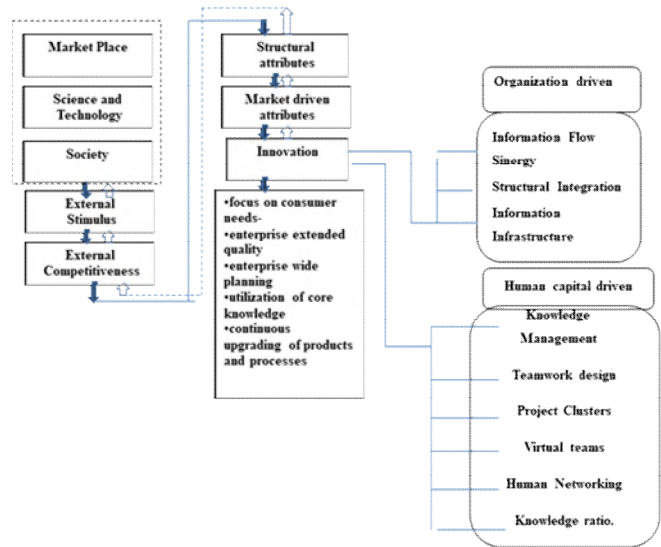


Figure 4. Main relationships between innovation and organization driven and human capital driven attributes.

Lastly, in view of the above described concepts, it can be stated that it is advantageous for an organization to include the innovation process in the structural characteristics of its management system, provided this process meets external needs, thereby boosting the company’s competitive edge.

As future work, we are planning to address the following: a) determination relationships between innovation and organization driven and human capital driven attributes that are more relevant to competitiveness that are preponderant to reach the necessary competitiveness level; b) use focus methodologies to establish these prevailing attributes. The lessons learned that in this article are: innovation cannot be seen as an independent characteristic of an organization or company, but as a market driven attribute that contribute to the company to reach the competitiveness level; it is important to carefully establish its relationships with other characteristics and attributes of the enterprise that are not clear at first view.

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