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Innovation: Technological and Cultural Construct Model

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ABSTRACT

The existing research and consequent literature on innovation are quite extensive. There is a vast variety of models that explain the many different dimensions and scopes of innovation, up to a greater degree. However, some dimensions and scopes of innovation are still to be discussed and researched, such as the cultural dimension and the creation process scope. Further, the relation between innovation and value creation is not yet discussed down to the needed deepness that can provide a clear understanding, for scholars and professionals, of the existing inter-connections between both.

This paper introduces a new discussion about innovation in the business arena, based on a dual approach, covering technological and cultural transformation or evolution. Despite many attempts to understand those two sides of innovation that mainly impact products (goods or services), we haven't yet reached a full understanding of how they interconnect and play together, and how they impact, individually or in conjunction, the value dimension of products.

The paper intends to bring a new theoretical base, inspired on existing literature and empirical observation, that encompasses the two most well identified sides of our lives, tangible and intangible, in an attempt to create a new basis of understanding for scholars, policy makers, professionals and business decision makers that can facilitate political and business decisions and increase the potential impact of these on the economy and society. The paper also aims at opening a larger area for future research and better understanding of ways to manage business and products and to influence the economy and society in the fields of technological innovation and cultural innovation.

Keywords: *cultural innovation, technological innovation, strategic innovation, value, value creation*.

1. INTRODUCTION AND LITERATURE REVIEW

There is an incessant urge for the creation, adoption and diffusion of innovation in our society, as referred by Pol and Ville [1]. Innovation can be classified in different sort**s**, like business, social and artistic for example (ibid.). The business innovation itself can be classified in other sub-levels, like "technological innovations (new or improved products or processes) or organizational innovation (changes to the firm's strategies, structures and routines)" (ibid., p.881), and it can have direct or indirect impact in other areas of our structured society, namely in the cultural and economic arenas.

The direct importance of innovation for firms, but indirect for the economy, has been widely studied by scholars, namely Cainelli, Evangelista, and Savona [2], Chaney and Devinney [3], Ferguson and Hlavinka [4], Geroski and Machin [5], King and Tucci [6], Marvel and Lumpkin [7], Matthyssens, Vandenbempt, and Berghman [8], Mishra and Bhabra [9], and Nayyar [10], most concluding that it reflects on greater profit margins and larger market shares as a direct result of increased customer loyalty and limited competitive entry into markets .

Innovation positively affects customer choice and preference for new products and competitive market dynamics, as identified by King and Tucci [6], and Marvel and Lumpkin [7], as it also aids existing products through updates that prolong product's lifecycles and retard their decline, as concluded by Berenson and Mohr-Jackson [11]. In fact, according to many authors, such as Atuahene-Gima [12], Chen, Lai, and Wen [13], Dutta and Weiss [14], Hult [15], Matthyssens, Vandenbempt, and Berghman [8], and Storey and Easingwood [16], innovation is generally identified as a key strategic element for firms seeking sustained competitive advantage.

Despite many current different views and definitions of innovation, we still need to make some distinctions between business and social related innovations. To Hamaleinen and Heiscala [17], there are five ideal types of innovation: "Technological innovation are new and more efficient ways to transform the material reality, and economic innovation puts technological innovation to the service of the production of surplus value. Taken together those two classes from the sphere of techno-economic innovations (…) Regulative innovations transform explicit regulations and/or the ways they are sanctioned. Normative innovations challenge established value commitments and/or the way values are specified into legitimate social norms. Finally, cultural innovations challenge the established ways to interpret reality by transforming mental paradigms, cognitive frames and habits of interpretation. Taken together these three classes form the sphere of social innovation" (p. 59). Even if it is accepted that techno-economic innovations are mostly business related and regulative, and that normative and cultural innovations are mostly social related, we cannot ignore the interconnections between all of them and the implications that those connections may have at the business level. This paper tries to explore those potential connections and how a better understanding of that can be used in order to help businesses in the decision making process.

1.1 What Is Innovation?

According to Cummings [18], innovation refers to a successful first time application in the market of a firm's product or process. Abernathy and Clark [19] agree with the concept and even connect the meaning of innovation to the creation of value added. Innovation is also "… a firm's tendency to engage in and support new ideas, experimentation, and creativity for the development of new processes" as referred by Lumpkin and Dess (p. 142) [20]. According to Piana [21] "innovation is the complex development of discoveries (eg. new physical laws) and inventions (eg. a new machinery) brought in the business and social environment (eg. introduced on the market), hopefully leading to diffusion (adoption by new users)". Schumpeter [22] even considered innovation as "creative destruction" when new technologies substitute the old. Today, the most well accepted definition is in the Oslo Manual: "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (p. 46) [23].

Innovation has been studied at industry, firm, and individual levels. It can address the needs of existing customers or be designed for new or evolving markets as pointed by Christensen and Bower [24]. Or it can focus mainly on the organization's side. The dual-core model of innovation, as referred by Daft [25], Grover, Fiedler & Teng [26], and Knight (27), divides organizational innovations into two levels: technical innovation and administrative innovation. Technical innovation, not technological innovation, relates to the technical nature of an organization or a primary work activity in which an organization converts raw materials into finished products. Technical innovations are not merely innovations resulting from advanced technology, but they are linked to the primary activities and the value adding process of firms, and adopted as a means of changing and improving those activities which in themselves may or may not exploit technology, as mentioned by Damanpour & Evan [28]. Administrative innovation refers to the behavioral or managerial side of the organization, the social system of rules, roles, procedures and structures (e.g. a new way to organize internal communication). Sometimes, according to Mouzas and Araujo [29], administrative innovation is used synonymously for organizational innovations.

However, when we come to the scope for the application of innovation, that being in what innovation is applied or used, and despite some slightly different opinions, such as from Schumpeter [22], Piana [21] and, Kingsland [30], it is widely accepted that there are four major types of innovation: "product innovation" – introduction of a new product (good or service) or major improvement of its characteristics; "process innovation" – implementation of new or significantly improved methods in production or distribution; "marketing innovation" – implementation of a new marketing method, evolving changes in design, packaging, placement, promotion or pricing; and, "organizational innovation" – implementation of a new organizational method in the firm's business practices, organization of workplace or external relations [23].

To simplify our understanding of the scope for the application of innovation, Pol and Ville's [1] understanding of innovation will be adopted, covering two levels: "technological innovations (new or improved products or processes) or organizational innovation (changes to the firm's strategies, structures and routines)" (p. 881). This is in line with other similar views that set the product and the organization as the arenas where firms' innovation is developed, like those of Fernandes [31], and, Fernandes and Martins [32]. Innovation at the product (good and service) level refers to the introduction of new functions or changes in existing products' functions (related to product attributes/functionalities demanded by consumers – thus, demand driven), the creation of new designs or adjustments in existing products' designs (related to the aesthetic side of the product supplied by the inducer – thus, supply driven), and the usage of new or substitute input (related to resources' offer – thus, context driven). Innovation at the process~~es~~ level refers to the creation of new methods or adjustments in existing methods (related to applied technology – hardware and software – thus, process driven). Innovation at the organizational level refers to the introduction of new or changes in existing management systems (related to the organizational structure, the ICT, and institutional relations with stakeholders – thus, organization driven). Innovation at the marketing level refers to new or changes in existing marketing strategies (related to promotional processes, image creation and development, and distribution network – thus, marketing driven) (ibid.). These last descriptions of innovation match extensively with the former definition in the Oslo Manual [23].

Innovation can also be seen in relation to its novelty or how it diffuses among firms and consumers. In relation to innovation adoption by firms, the Oslo Manual classifies it at three levels: "new to the firm" – first time a firm adopts a given innovation; "new to the market" – first time a given innovation is introduced in a market (or industry); and, "new to the world" – first time that an innovation is introduced to all markets and industries, national and international. Regarding adoption by consumers, Rogers [33] considers five levels of innovation diffusion: "innovators" – brave people, first to try; "early adopters" – opinion leader, try out new ideas; "early majority" – thoughtful people, accept changes more quickly; "late majority" – skeptic people, use only when majority is using; and "laggards" – traditional people, only accept new idea when it becomes mainstream. Innovation adoption, according to Wejnert [34], may have consequences, being "public", referring to entities other than the actor, or "private" when related to the actor itself.

A full understanding of those concepts of innovation was important to develop the proposed innovation construct model later in this paper.

1.2 Innovation Models

The most well-known and used model to express and characterize innovation, mentioned by some different authors, like Schumpeter [22], and, Sheikh and Oberholzver [35], includes two kinds of outcomes, "radical" and "incremental": radical innovations being the creation of major disruptive changes, and incremental innovations the continuous advance of the process of change. Some authors, such as Henderson and Clack [36], Christensen [37], Abernathy and Clark [19], Markides and Geroski [38], and, Kingsland [30] found this simplistic approach insufficient and incomplete to characterize innovation.

Christensen [37] introduced another level of innovation to the continuous action of the "sustainable" innovation, the "disruptive" innovation, where the last represents a moment in time when, supported by new technology, a producer introduces in the market a product, potentially at a lower performance level but at a much lower price, which will replace an existing product in the long run, thus being destructive by nature.

Henderson and Clark [36] developed a model of innovation based on technological changes supported by knowledge that affect products in two major variables: the core concept (architecture) of the product and the linkage between the core concept and the components. The outcome is four types of innovation: "radical" – new core design concepts embodied in components linked together in a new architecture; "incremental" – refinement and extension of existing design; "modular" – changes on the core design concepts of a technology (e.g. replacement of analog by digital telephones); and "architectural" – changes in the relation between core design and components (product architecture). This model focuses on the technological product transformation as the avenue to reach innovation.

Abernathy and Clark [19] presented a model based on two major variables: existing market linkages – activities the firm needs to serve new markets and consumers, and existing firm's competence – how technological and production activities are organized. This leads to four types of innovation: "niche creation" – creating new markets but using existing technology; "regular innovation" – reinforcing existing technical capabilities to serve existing markets and consumers; "revolutionary innovation" – creating new technical and production competences to serve existing markets and consumers; and "architectural innovation" – designing new technological concepts to develop new connections with the market, creating a new architecture for the industry. This model focuses on the organizational capability of firms in developing technology and relations with the market to create innovation, which will be reflected on the product side. Davila, Epstein and Shelton [39] also present a similar model focused on the organizational side, but based on the variables "technology" and "business model".

Markidis and Geroski [38] focus the consumer as the main objective of innovation, using two major variables: the effect of innovation on consumers habits and behaviors, and the needs for firm's competences and capabilities (including technology), resulting in four types of innovation: "major innovation" – requires fundamental changes in consumers' behaviors, based on existing competences and capabilities of the firm; "incremental innovation" – minor changes on products and services using existing competences and capabilities; "strategic innovation" – changes are not at the technological level (product – good or service) but at the strategic level (business and organization design) to undermine competitors; and "radical innovation" – new scientific and technological concepts to create new markets.

At a more strategic level of business model definition, especially in the IT world, Kaplan [40] used the identification of opportunities in the long run through innovation development and the need for firms to stay focused on the short term results to construct a matrix which leads to four types of innovation: "radical cannibalism" – substituting own successful products by new technologies and processes, forcing a turnaround in customer value; "competitive displacement" – displacing competitors by applying competences or industry characteristics to other markets or industries, forcing competitors to leave; "market invention" – some technological changes allied with a strong effort on market research and creativity creating new products with alternative customer value for existing markets; and "industry genesis" – introduction of new technology and new value for customers, potentially creating a new industry.

The previous modeling concepts can be seen, to a large extent, as based on scientific and technological development, initiated and supported by intensive R&D activities, in a kind of approach that Kline and Rosenberg [41] called "linear model" of innovation where research, development, production and commercialization follow on in sequential order, as it has been understood for decades.

Historically we may find that the innovation process has suffered some evolution itself beside time. Dodgson and Rothwell [42] presented five generations of innovation during the last half of the twentieth century: "technology push" – fifties to mid-sixties, due to fast economic growth and based on new scientific knowledge and technologies; "market pull" – mid sixties to beginning of the seventies, focusing on firms' response to market needs through R&D; "coupling R&D and marketing" – mid seventies to mid-eighties, focusing on product portfolio in order to reduce costs; "integrated business processes" – mid-eighties to beginning of the nineties,

focusing on integrated business processes in order to reduce time for products to enter the market; "system integration and system networking" – since mid-nineties, focusing on "business ecosystems" supported by business process automation using ICT and networking.

Currently, firms have a different approach to innovation as far as collaboration is concerned, being closer to the proposed "chain-linked model" of Kline and Rosenberg [41], cutting the old linear approach and creating a much more dynamic approach, including multi-dimensions and multi-dynamics, encompassing knowledge, competences and capabilities from external and internal participants. Many other authors, namely Edquist [43], Kusiak and Tang 44, Piana [21], and, Fernandes [45], have defended these new dynamic innovation processes and knowledge diffusion**s**, bringing value to other stakeholders excluded before.

This comes in line with a recent tendency of how firms define and use collaboration in innovation projects. Collaboration can be "closed" inside a firm's organization systems and resources or be "open" to outside systems and resources like clients, suppliers, opinion makers, and specialists, as defended by Chesbrough [46], and, Chesbrough and Appleyard [47]. Same of the benefits pointed to "open innovation", when comparing to "closed innovation", are: opportunity for collaboration, closer relationships with customers and suppliers, quicker feedback, richer reflection on the results of distributed experimentation and greater scalability. While closed innovation is based on a push approach, expecting to anticipate demand and create offer accordingly, open innovation has a pull approach, using inside and outside resources (tangible and intangible). This much more dynamic approach is leading to a faster diffusion of knowledge and competences throughout all stakeholders involved, and forcing innovation to enter new dimensions.

All previous modeling concepts of innovation, and many others not mentioned, provide us with a vast understanding of what innovation is, what are the results of innovative actions and consequent impacts on consumers, industry and economy, and how it happens in a market, an industry or a firm? However, there is still a need to understand the process that an industry or a firm develops and applies in order to generate innovation of different kinds and the relation between that and its final output or outcome. We may foresee in this evolution of the understanding of innovation a path to other areas of application or scope than products (goods and services) and organizations (processes, marketing methods, and organizational systems). As we have seen, technology is present in most concepts and models, but we also found a lack of articulation of such variable**s** with others that are related to the intangible side of innovation and peoples' lives, such as emotions and attitudes that innovation may generate and, consequently, cultural paths that may result from those. That will be addressed in this paper, as a tentative to develop a new understanding of how innovation occurs, what are the common processes that lead to such phenomenon, what are the ideal environments where innovation strives to happen in dimensions other than only the technological, and how all that is interconnected.

1.3 Facilitating Means Of Innovation

Technology is the concept that is most connected to innovation creation and diffusion.The word technology comes from the Greek technologia, which is a combination of techne, meaning "craft", and logia, meaning "saying". Technology is a broad term that refers to artifacts created by humans, such as machines, and to methods used to create those artifacts. It might be considered as the articulation of a craft, but it can also be used to describe the extent to which a society can manipulate its environment. In today's semantics it is often used to refer to high technology – rockets, computers, cell phones, medical devices– rather than technology in general. But when anthropologists use the word "technology," they go all the way back to the controlled use of fire (from about 500,000 – 1 million years ago), the invention of the wheel (c. 4000 BCE), and beyond. The first technological tools were simple hand-axes made by our hominid ancestors millions of years ago.

Technology research and development refers to the invention, design, improvement, and construction of new types of products, equipment, and machinery. We may find references to "high-tech", "medium tech" and "low tech" being industries such as aerospace, computers, semiconductors, telecommunications, pharmaceuticals and instruments commonly classified as high-tech, while medium-tech typically includes electrical and non-electrical machinery, transport equipment and parts of the chemical industries, and the remaining low-tech, low R&D category, comprises industries such as textiles, clothing, leather products, furniture, metal products and so on, as mentioned by Fagerberg [48]. A significant portion of technology research and development is dedicated to coming up with creative, useful inventions. All advances in innovation since the beginning of Mankind have a technological base, we may say, independently of its type.

Another means to create and diffuse innovation is culture. For anthropologists and other behavioral scientists, culture is the full range of learned human behavior patterns. The term was first used with this meaning by Tylor [49], to whom culture is a complex whole that includes knowledge, belief, art, law, morals, custom, and any other capabilities and habits acquired by Man while member of society. Culture is a survival tool for Man and it is "mankind's primary adaptive mechanism", as defended by Damen, (p. 367) [50]. It is a fragile phenomenon, as it exists only in Man's mind. To Banks and McGee [51], written languages, governments and administrative organizations, buildings and infrastructures, and other man-made things are merely the products of culture, and not culture in themselves, as the essence of culture is not its artifacts, tools or any other

tangible element but how the members of the group interpret, use and perceive them.

Culture is constantly changing and easily lost or destroyed. Values, symbols, interpretations and perspectives tie and distinguish one people from another at the same time. Culture encompasses patterns, explicit or implicit, expressed by behaviors, and it is transmitted by symbols. It is created by knowledge, which serves to perceive, interpret, express and respond to the social reality, as argued by Lederach [52]. Culture has influence on innovation as it reflects on peoples' needs and wants, but it can also be affected by innovation. Many products and services are a clear reflection of a certain culture but some cultures have characterized behaviors that were extracted from the use of specific products (goods or services). Culture can be the cause of innovation, and vice versa.

1.4 Why Innovation?

We can identify some major drivers behind the emergence of innovation being cause and often also effect, which we can divide in three groups: (i) new consumer needs: needs for new functionalities (new attributes demanded by consumers) at the product (good or service) level; needs in the operational field (ease of utilization) at the user level; and needs for new design (fashion alternatives) at the aesthetic level; (ii) new market contexts: general needs (political, economic and social) that affect the population; rivalry changes (among type and number of competitors) due to variations in demand; and context/environmental changes (scarcity of natural resources) due to availability of natural resources; and (iii) new capabilities from inside or outside the industry: new knowledge (scientific and technological) coming from R&D; new applied technology (at the hardware and software levels) related to product and process development; and inputs (new or substitute materials) from R&D.

There is also an endless number of references to the benefits and positive impact of innovation in many areas and fields of present day and future economy, most measured and proved through research, as done by Teece [53]. Fagerberg [54] points out the role played by innovation in long run economic and social change, and many of its consequences:

"- Innovation introduces novelty (variety) into the economic sphere. Should the stream of novelty (innovation) dry up, the economy will settle down in a "stationary state" with little or no growth. Hence, innovation is crucial for long-run economic growth.

- Innovation tends to cluster in certain industries/sectors, which consequently grow more rapidly, leading to structural changes in production and demand and, eventually, organisational and institutional change. The capacity to undertake the latter is important for the ability to benefit from innovation.

- Innovation is a powerful explanatory factor behind differences in performance between firms, regions and countries. Firms that succeed in innovation prosper, at the expense of their less able competitors. Innovative countries and regions have higher productivity and income than the less-innovative ones. Countries or regions that wish to catch-up with the innovation leaders face the challenge of increasing their own innovation activities towards leader- levels" (p. 13).

According to Barnett [55], innovation has gained extra importance since it was clearly accepted as the base for many cultural changes. This concept will be explored later in the paper.

2. A CLOSER BACKGROUND

2.1 How Innovation Impacts Value

Value is a wide concept. When researching the existing literature, one can find many different forms of defining and expressing value. Among many existing forms of "value", there are some that are mostly accepted as identified by Jensen [56]: (1) "value" in the singular, such as use value (value as utility), economic value (exchange value), cultural value (value as meaning and sign) and perception value (value as experience); and, (2) "values" in the plural, such as religious values (values as belief system) and behavioral values (values as moral and ethical).

Value can also be seen as the absolute criteria used in any decision making process. This applies to any "objective output" of any action taken by individuals or collective groups of people. Therefore, any human activity is potentially producing, positively or negatively, some kind of value. This leads to the definition of different value outputs, like: (1) value creation – first time process transformation of an input into a certain output, which is accepted by people for use or consumption (i.e.: first microwave oven, first television set, first x-ray machine); (2) value generation – repetition of the value creation process, achieving the same output (i.e.: industrial production of any product); (3) added value – augmented value resulting from the aggregation of some additional value to existing value (i.e.: aggregation of cultural value to existing use value, like applying a brand name to an existing product); (4) value improvement – increment of existing ratio between use value and economic value of a product; (5) value accumulation – retention of produced value for future utilization, in any form of product, idea or contract, (i.e.: stock of products, patents or obligations); (6) value consumption – utilization of existing accumulated value through consumption to maintain a certain status quo (i.e.: consumption of combustion material to generate electricity for any purpose); and, (7) value destruction – elimination of existing accumulated value through purposed or un-purposed action or event, by people or by nature.

By definition, innovation produces new value, or from another perspective, value creation, value addition and value improvement are always the result of an innovation process. This strong link leads to a more profound comprehension that needs to be achieved. Departing from the previous types of value and value outputs, one must be able to determine which of those may be part of a product (good or service). That characterization can be expressed by a value profile or curve, in a graph form.

2.1.1 At the consumers' value curve level

In order to understand how innovation impacts a product (good or service) value curve, one needs to define it. According to Kim and Mauborgne [57] the value curve is the expression of the level of performance or any other measurement of a product (good or service) attribute. These goods and services attributes are in fact functions that are performed and delivered to the benefit of users or consumers. To measure the performance of these functions, Value Management normally applies a similar tool, named value profile, but going even deeper in the evaluation by quantifying the relative importance of users' (service) functions. Therefore, we may conclude that the value curve is the representation of the level of performance, or any other indicators, of all attributes of a product (good or service).

As argued by Kim and Mauborgne (ibid.), the innovation has direct impact on the performance of the attributes, consequently changing the profile of the curve. This kind of impact can also be achieved by introducing new, or excluding existing, attributes (functions) to the product (good or service). Resulting from those changes on the value curve, we can determine four different types of innovation: "adding-value", by increasing performance on most attributes and shifting the curve up, providing a premium product value; "turning-around", by rearranging the level of performance of the attributes, and creating an alternative solution to existing products at a lower cost to customers; "up-grading", by introducing changes into the most important attributes while leveling all other attributes to the minimum level accepted by users and consumers thus creating differentiation; and, "breakthrough", by creating a new standing along value curve, that is a new product [31]. Different changes on the value curve induce different changes on the "value" for the customer.

2.1.2 At The Producers Technological Process

The adoption of innovation by firms has a strong impact on the value creation process at the firms' and economy levels. Various studies, such as those of Chandler [58, 59], Posner [60], Fagerberg [61], and, Fagerberg and Verspagen [62], prove that firms adopting innovation, independently of its kind, have augmented their added value. Despite the associated risk, innovation is often seen as the quickest way to avoid strong competition.

2.2 Recent work

2.2.1 Holistic value construct model

Value, as a holistic concept, encapsulates various categories such as economic value (value as exchange), use value (value as utility), cultural value (value as meaning and sign) and perception value (value as experience), being all these type of value in the singular [56]. To frame our comprehension, values, in the plural, such as religious values (values as belief system) and behavioral values (values as moral and ethical), were left aside, as they are apparently at a higher level, which influence the former. The holistic value construct model [63], as in fig. 1., is based on two variables, "value materialization" (varying from simple to complex), expressing the simplicity or the complexity of the value creation process, and "value form" (varying from tangible to intangible), expressing the physical and the non-physical content delivered as result of the value creation process.

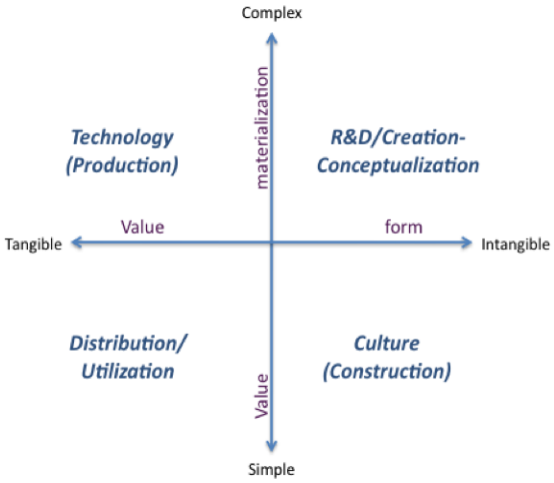

Fig. 1. Holistic Value Construct model

These two variables combined define four value archetypes: (1) "complex-intangible" – idea creation, conceptualization and discovery; (2) "simple-intangible" – construction of something based on outcomes from ideas, through some kind of artistic creative and aesthetic process which develops human emotional related process that takes ideas into some physical or non-physical form; (3) "complex-tangible" – production of something based on outcomes from ideas, through technological processes that take ideas into some physical or non-physical form; and (4) "simple-tangible" – distribution and utilization of what comes from ideas.

In order for a product for consumption or utilization (simple-tangible quadrant) to enter the market for the first time, where consumers and users find the product at a certain level of value in both fields of tangible and intangible value, first it needs to pass through some or all of the other quadrants.

The first value in the product is created at the idea creation, conceptualization and discovery quadrant (complex-intangible), even if it has no materialization in any physical or non-physical form yet. We may say that

this value is still only potential, as there is maybe no form in which it can be expressed or understood.

The materialization of the product, in a physical or non-physical form, will happen when it passes through a process of production. This happens at the complex-tangible quadrant, through the application of technology. Physical products (goods) and non-physical products (services) are the result of some applied technology (any man made thing or process is always the result of some applied technology).

The construction of a culture to be attached to a product is based upon the meaning and sign that can be given to the consumption, utilization or ownership of it. This construction of culture happens at the complex-tangible quadrant, when by some different means the product becomes of cultural value as a result of cultural innovation.

To help the understanding of this value construct concept, we may take the case of a common computer mouse. Its value starts to be built at the complex-intangible quadrant, when someone conceives the utility functions for users and the technical functions that will deliver those utility functions. After it, the product value increases through the application of technological solutions to make the technical functions work. Finally, the product value increases at the simple-tangible quadrant when the product is distributed to users and subjected to some extra-applied services. A computer mouse has only tangible value at a first instance, meaning that it has use value (value as utility) and economical value (value as exchange).

However, exceptional situations can lead to the creation of some intangible value, especially at the level of perception value (value as experience), at the individual utilization sphere, where added services can play an important role. Even more exceptional for the case of the computer-mouse is the case of the utilization of a certain computer-mouse brand becoming of some meaning and sign to a group of users, therefore having cultural value. In this hypothetical case, the product will have tangible and intangible value, resulting from technological and cultural innovation processes. This will be viewed next at the innovation discussion.

2.2.2 Innovation Along The Value Construct

Every process of value creation, beginning at the idea conceptualization and ending at the product offer, is related to a value curve, either new or modified, as mentioned before. As innovation also affects or is affected by changes in the value curve, we therefore may say that value creation overlaps innovation in operational terms and vice-versa. Assuming that value creation, in the holistic value construct model, starts at the complex-intangible value quadrant (R&D/Creation-Conceptualization) and ends at the simple-tangible value quadrant (Distribution/Utilization), passing through either the complex-tangible value (Technology) or the simple-intangible value quadrant (Culture), respectively or simultaneously, we must at the end have some kind of product (good or service) to offer for the utilization of consumers or users. The first process of value creation is obtained through the "production" of technology and the second through the "construction" of culture.

The model leads us to conclude that we achieve value creation through a "technological path" or through a "cultural path", being the first related to the tangible side of things, and the last to the intangible side of things.

Technology has suffered an exponential development lately. The holistic value model demonstrates that the production of technology is of great importance in the creation of tangible value in our economy as it leads to new and improved saleable products (goods and services) through innovation. On the other hand, in modern theory the economy is based on behaviors, therefore is of cultural dimension, which brings importance to the construction of culture and the creation of intangible value in our economy where cultural innovation plays an important role.

3. THE PROPOSED MODEL

The proposed model in this paper encompasses two parts: a "technological dimension" and a "cultural dimension". The first refers to any change, large or small as defined by the model, applied to products (goods or services) and organizations (processes, marketing methods or organizational systems), in a closed or opened collaboration, but mainly based on the tangibility of outcomes achieved through technological applications. This is a view from the firms' standpoint, when, strategically, they define the kind of technological innovation process they ought to apply in order to reach specific objectives. The second refers to changes at the behavioral level of consumers, based on the intangibility of outcomes attained through cultural transformation. This is a view from society's standpoint, but that can be used by firms when they define the cultural impact they desire and expect to have on consumers and society at the moment of creating new or modifying existing products. This will be explained next.

3.1 The Technological Innovation Construct Model

3.1.1 The Technological Variables

In order to understand the variables that contribute to technological innovation, we must first understand what technology is. One of the most general definitions of technology is the application of science or knowledge to commerce and industry. According to businessdiccionary.com technology is "The purposeful application of information in the design, production, and utilization of goods and services, and in the organization of human activities". Despite the potential disagreement about the accuracy of any definition, we may define technology as "the applied knowledge to a (physical and non-physical) tangible value form utilizing physical

(hardware) and non-physical (software) means in a systematic way". Tangible value form relates to an output of any action or event that is accepted by Man as adequate for use and for exchange (transaction that implies a defined compensation) and, therefore, measurable and quantifiable in close boundaries for most people.

Another term that needs a clear understanding is technological innovation. According to Tornatzky and Fleitcher [64], technological innovation is the process of introducing new tools in a specific social environment and the tools by themselves. The technological innovation process is often related to the dynamic desire of innovating and there are two variables that can influence that dynamic: the technology derived from systemic knowledge, normally of scientific nature, and the technology normally involving a mixture of physical artifact and social context and content. Despite the fact that the word "technological" has been removed from the definitions in the Oslo Manual [23], it is still understood, as before, that innovation itself is an iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which can lead to development, production, and marketing tasks striving for the commercial success of the invention, as defended by Garcia and Calantone [65]. We may conclude that technology is "a Man created process based on knowledge". This means that a technological outcome may have a physical or tangible form (product), or a non-physical and intangible form (service), independently of using physical or non-physical tools in the creation, development and production processes.

Thus, one may say that technological innovation can be "the application of technology in the production of physical (hardware) and non-physical (software) outcomes that artificially substitute human labor and reduce the utilization of resources (production costs), being the outcomes accepted by market materialized in some object or equipment and presented as a tangible good, or in some software or convenience form as an tangible service". New or modified organizations' internal processes, management systems and other non-physical outcomes, most expressed in the form of labor activities, resulting from human intelligent actions, can be considered as services, and, consequently, resulting from technological innovation.

Following a mechanism-type approach, we can characterize technological innovation by two variables: (1) "what" one wants to achieve (goals and objective) and, (2) "how" one may achieve it. The "what" is represented by the product (good or service) value curve outcome and the "how" by the process applied to the innovation process?

3.1.2 The Four Resulting Archetypes Of The Technological Innovation Construct Process

Any creation process, or innovation process for that matter, is defined by some inputs (even simples ideas), some outputs (even some simple behaviors), and a group of activities (even pure creative thinking) that transform the former into the latter. Thus, a (creation) process is a set of standardized performed activities (by humans or machines) that transform inputs into outputs. A process can vary between a very specifically defined set of procedures (rules to perform activities) and a loose form. Therefore, it ranges from completely loose to completely procedural.

The result (output) of any creation process can be measured by its value, expressed by a value curve. The value curve is a representation of the level of performance, or any other measurement, of all attributes of a product (good or service). A value curve status can be defined by completely new attributes in a new product (good or service), or by the variations on the performance dimension of new or existing attributes in an existing product (good or service), under any stakeholder perspective or interest. Therefore, it ranges from slightly modified to completely new.

The previous variables, product "value curve" and product "creation process", are adopted to generate a matrix to help define the different archetypes of the technological innovation construct process, as in fig. 2.

A- The "planned/structured" archetype of innovation is characterized by well defined sets of operational procedures that lead innovation to a well defined range of results on the product (good or service), based on fundamental and applied R&D. According to CIS (European Community Innovation Survey) criteria [66], this fits in the R&D investment based innovation type. The process of this type of innovation is analytical, science based, and develops new knowledge about natural systems by applying scientific laws (know why), based upon scientific knowledge and models, deductive by nature, and supported by collaboration within and between research units or entities, producing strong codified

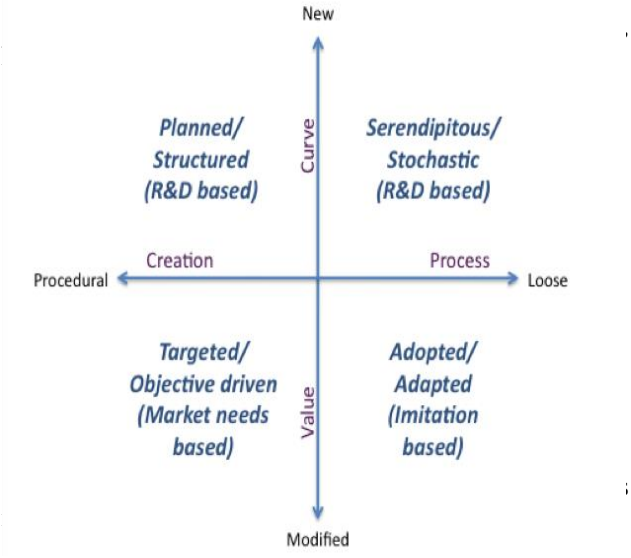

Fig. 2. Types of technological innovation construct process

products (goods or services), but mainly takes existing products and organizational processes into further stages of development, changing the number of attributes or moving their performance to higher levels, thus altering the existing value curve, most of the cases improving product or organizational processes performance. Hybrid cars are a typical example of this sort of innovation at the product level. New forms of distribution (e.g. Internet) are examples of this innovation at the organizational processes level. Slocum [67], Marigliano [68], and, Malkin and Hanik [69] argue that the need for being able to produce an innovation or series of innovations, as required by consumers, forces firms to continually reinvent their product portfolio. The focus of these firms is on duration and market target, as time to market and customer specification are crucial for their survival. Examples of this type of innovation process can be found in the field of medical devices and equipment production, industrial automation and robotization, aero and space industry, pharmaceutical industry, and similar ones.

B- The "targeted/objective driven" archetype is characterized by a well "defined objective" that is related to the specific needs of users, consumers or of the organization. According to CIS criteria [66], this kind of innovation mostly fits in the non R&D based innovation class, focusing mainly on design innovation. The process of this type of innovation is symbolic (art-based), creating meaning, desire, aesthetic qualities, affect, symbols and images (know who), based on creative processes and supported by high interaction between teams and projects, requiring creativity, importance of interpretation, cultural knowledge, creating sign value and implying strong context specificity.

This type of innovation relates to the augmentation of the value added on products or services, taking those into specific niches of users and consumers and providing solutions to well determine needs and wants, often becoming premium products or services. Circe du Soleil is an example of this kind of innovation. At the organizational level this innovation targets new processes, focusing on and answering specific characteristics and needs of users and consumers (markets). According to Daft [25], and, Damanpour and Evan (70), it is understood that the focus of innovation at the organizational level is the adoption of an idea or behavior new to the adopting organization, being innovation the result of a process that includes the generation, development, and implementation of those new ideas or behaviors. Whether the needed knowledge for the adoption of innovation is generated internally or acquired externally, its value is enhanced by its diversity (i.e., its ability to suggest new opportunities and solutions), as defended by Hitt, Bierman, Shimizu, and Kochhar [71], and, Marvel and Lumpkin [7]. The focus of the firms developing this kind of innovation is on creating value through the response to niches' specific needs and wants as a result of outcome meanings being highly variable between places, classes and genders. Examples of this innovation process can be found in part of the car industry, packaging industry, clothing industry and furniture and household industries.

C- The "adopted/adapted" archetype relates to strategies of adoption and adaptation of innovations initiated and developed by others, based on the "imitation" of products (goods and services) attributes and of organizational processes. According to CIS criteria [66], this kind of innovation mostly fits in the non R&D based innovation class, focusing mainly on equipment and input-embodied innovation. The process of this type of innovation is synthetic, engineering-based, applying or combining existing knowledge in new ways (know how), based upon problem solving capabilities and custom production, therefore being inductive, and supported by interactive learning with customers and suppliers, producing partially codified knowledge and strong tacit components which are very context-specific. It seems to fit what Daft [25] Grover, Fiedler & Teng [26] and Knight [27] call technical innovation.

This kind of innovation provokes minor changes on products' and services' value curves and process changes (e.g. cost reductions, marketing approaches) at organizations' level. The ability to exploit external knowledge is a critical component of this kind of firms' innovative capabilities, as Cohen and Levinthal [72] argued. March and Simon [73] suggested that at the organizational level most innovations result from borrowing rather than (real) innovation. Firms taking this kind of innovation on board are just trying to survive against strong competition. Some will take innovation strategically and will advance to other forms of innovating their products and organizational systems, thus surviving, but others won't.

D- The "serendipitous/stochastic" archetype is defined by stochastic results of focused or trial and error experiments. It is mostly based upon fundamental and applied R&D. According to CIS (European Community Innovation Survey) criteria [66], this also fits in the R&D investment based innovation profile. The process of this type of innovation, like the planned/structured type, is analytical, science based, and developing new knowledge about natural systems by applying scientific laws, supported by collaboration within and between research units or entities, producing a strong codified knowledge content, highly abstract, but universal.

Normally, this kind of innovation creates new products with new attributes and, consequently, new value curves, very often uncovering new consumption niches or even markets (eg. Post-It Notes; microwave). Serendipity refers to the accidental discovery of something valuable, as referred by Mendonça, Cunha and Clegg [74]. Unexpected discoveries may occur because people are in the right place at the right time. Time, as a domain of prediction and regularity, has to be related to the organization: temporal happenstance is sometimes a

domain of unsuspected discovery. People discover things because they were lucky to be there when something happened. Serendipitous discovery also involves active learning and analysis. Despite its accidental nature, people discover things by accident when they make a purposeful search effort. In the first case, a structured process of analysis may lead to surprising findings. In the case of intuition, learning results from establishing connections that were not previously proposed. In the improvisational mode, people act in order to learn. The difference between serendipity and other forms of learning lies in the elements of surprise involved, as Cunha [75] mentioned. Every serendipitous invention can be reduced to a heuristic and ultimately to an algorithm or pattern which can repeat itself. According to Boyd [76], capturing these patterns and codifying them into templates may create an effective way to innovate and achieve growth. Most of the serendipitous innovation comes from R&D activities, as Reynolds and Isaac [77] argued, and firms compete in a race that shows that the intensity of rivalry between market participants leads to an increased speed of R&D, which, according to Gottinger [78], is the main characteristic of a frontier race. However, Weeds [79] argues that this kind of innovations seems doomed because "greater economic uncertainty is likely to reduce overall research activity and, to the extent that new technology is an important engine of economic growth, the resulting growth rate is likely to be lower". Only large and very profitable firms can afford to pursue a strategy of serendipity innovation.

From a historical point of view, it seems that targeted and serendipitous archetypes of innovations are radical, and planned and adapted archetypes of innovation are incremental, as somehow defended by Palmer and Kaplan [80], and it also appears that innovation in pre-modern times was more based on serendipity in opposition to modern times when it is more often based on structured style.

3.2 The Cultural Innovation Construct Process

3.2.1 The Culture Subject.

To understand later on which variables contribute to cultural innovation, first we need to understand what culture is and what it can mean to the business world. According to Hofstede [81] culture is "the collective programming of the mind which distinguishes the members of one category of people from another". Culture in this sense is a system of collectively held values. According to Schein [80], culture is "the deeper level of basic assumptions and beliefs that are shared by members of an organization, which operate unconsciously and define in a basic 'taken for granted' fashion an organization's view of its self and its environment". This looks more like an organization's inside view of culture. Aguilar-Millan [83] argues that we must even consider that, in accordance with the "spiral dynamics" concept: - in dealing with others, people reflect their own life conditions, which are bundled into "memes" – aggregation elements of cultural influence, attitudes, ways of doing things, etc. Culture is, therefore, the human-made part of the environment, as long defended by Herskovits [84], and it can be divided into objective culture (eg. roads, buildings, and tools) and subjective culture (eg. beliefs, attitudes, norms, values, role definitions), as defined by Triandis [85].

It is widely agreed that culture consists of "shared" elements, as defended by Shweder and LeVine [86], that provide the standards for perceiving, believing, evaluating, communicating, and acting (I see the last two as behavioral forms) among those who share a language, a historic period and a geographic location [85]. The shared elements are transmitted from one generation to the next with modifications, encompassing unexamined assumptions and standard operation procedures that reflect "what was worked" at one point in history of a culture group [82].

Postmodernism has had a major influence on culture and the way it manifests in our society. Baudrillard [87] defines culture as: "(1) An inherited legacy of works, thought and tradition; and, (2) A continuous dimension of theoretical and critical reflection – critical transcendence and symbolic function" (p.101). The author distinguishes between the High Culture and the Mass Media Culture or, as he calls it, the Lowest Common Culture. For him, the High Culture is available only to the elites of the society, as it has been for centuries. In this, and bringing the issue down to the level of culture products, which is of interest to this paper, he encompasses the true works of art that have passed the test of time, those unique and invaluable products that are irreplaceable and hold intrinsic value that grows as years, or even centuries, go by. The Lower Common Culture is the popular culture, the culture of the masses, as mass production, and mass communication has made it available to all social categories. The author argues that the mass production of that which is unique is the one reason for the downfall in culture and the apparition of the Lower Common Culture together with the mass media movement. The High Culture becomes subjected to the same competitive demand for signs as any other category of objects, forcing production to meet the demand. As culture becomes a commodity, the new objects are no longer seen as works of art but just as finite objects into themselves. The value has decreased to the point where they became mundane, "part of the package, the constellation of accessories by which the socio-cultural standing of the average citizen is determined" (ibid., 107).

Thus, we come to a point where one may understand culture as "a set of attitude patterns of a population towards a certain subject, expressed in an intangible or tangible (value) form, reflected in general and consistent/systematic behavior that can be transferred to or make use of objects". We must remember that intangible value form relates to everything, output or not of an event or action, which cannot be exchanged (transacted against a compensation) as such and, therefore, it is not measurable

and quantifiable inside close boundaries for most people, while tangible value form relates to everything or object, output of an action or event, such as products (goods or services) that can be exchanged, therefore measurable and quantifiable inside close boundaries for most people.

Some communal work has been developed on the concept of cultural innovation. According to wiki.answers.com discussion panel, "cultural innovations are internal changes that depend (and are limited) upon the recombination of already existing elements in culture. They can occur independently in different times and places, however not all lead to change in culture. They occur more frequently in technologically complex societies than in less developed ones." This is more of a general society view that is also of interest to this paper.

Cultural innovation may be seen under two different perspectives: (1) as the creation of a collective common adopted behavior based on an idea with no materialization in any physical product (good or service) [e.g. part of the population start using long-hair, speaking a new dialect, start following specific custom or start grouping around some spiritual beliefs); and, (2) as the creation of a collective common adopted behavior through the utilization of a product (good or service) that contributes to creating a preference, a meaning and a way of being and acting in a large portion of a population or of a region (e.g. people creating new rules to regulate peoples' behaviors supported by a judging system, creating Internet social networks that allow users to create social/cultural ties, creating new music styles supported on the utilization of specific new musical instruments (eg. Jazz, Hip Hop), developing new fashion styles through the creation of specific cloths (eg. T-shirts and miniskirt), inducing certain life styles through the utilization of certain new products (eg. walkman, toaster, microwave, tattooing equipments), or still, creating a certain painting style or technique which has originated a different painting style). Thus, we may define cultural innovation as an "effectively adopted or changed collective behavior in a group of people".

As an example of cultural innovation, we can use someone creating an educational/training method using new behavioral techniques but no physical objects (only the learners' five senses) that potentially will develop an individual behavior (manner of acting in the educational/training field), which can be followed collectively by others and, therefore, become culture.

Culture is intangible. Cultural innovation creates intangible value that cannot be measured in a quantitative form, but can be felt and lived in a qualitative form. A good example is a full school or academic program, based on a procedural block of teaching and learning techniques set to be followed by all participants and aiming at established objectives, must be considered technological innovation even if it has no physical form and no equipments and objects may not be involved. The same applies to justice. Laws come as outputs of cultural innovation but the court system that applies laws composed of processes is an output of technological innovation. This potentially ambiguous understanding may influence the way we deal with economics and management.

3.2.2 The Cultural Scope

To frame out our endeavor of understanding cultural innovation, we need to define a culture scope for our applied observation and discussion. In these terms, we consider that our discussion is set inside a time and cultural frame that is known as postmodernism movement or epoch. This also reduces all of our considerations to the western society context from which observations were made.

Postmodernism has become popular at the turn of the twentieth century, substituting Modernism as the dominant culture. The Modernism movement was all about rationality, discovering the limits of human intelligence and improving the individual, taking this to the next level. As opposed to the previous movement, Romanticism, in modernism science is king and rules. Where Romanticism previously dictated that man should go back to nature, to creation and fight for individual liberty, modernism imposed that only through science and rationality shall the human being progress.

In opposition, the Postmodernism movement stands for a current of thinking and a set of values as well as ways of seeing the world, which values, beliefs and categories spread around from politics to literature, culture, art, etc., and dramatically changes the modern world. As far as aesthetics go, the new postmodern approach encourages self-expression, personal development and experimentation. It takes the rational out of art and encourages feeling and experience. Drolet [88] argues that the new aesthetic repudiates "the rational conceptualization of sense experience as a prelude to formal representation, narration and interpretation" (p. 8).

Modernism has created a world where everything is scientific, technologic and rational. Postmodernism points out that the world isn't merely scientific, it's also about aesthetics, art, language etc. In the modern era, according to the dichotomy production/consumption, the producer was the creator of value – a desirable status, while the consumer was the destroyer of such value, thus creating an image of a social pariah, whereas Postmodernism sees everyone as consumers first, and then as producers. According to Firat & Venkatesh [89], this paradox is resolved by making everyone a consumer and a producer (of value through the act of consumption) in turn. Postmodernism creates a shift from the core values of modernism. While the later promoted economy, science and technology, Postmodernism is more of a cultural movement. It promotes "ideas of culture, language, aesthetics, narratives, symbolic modes, and literary expressions" (ibid., p. 243). Modernism created a set of

beliefs and rules that boxed the world and offered it to the people, being its main message: this is the world, this is how you live; while Postmodernism encourages diversity, meaning that: there isn't just one world - each person creates their own frame of mind, their own boundaries and their own interpretations. In modern times, the product was bought for its utility, whereas in postmodern times what is bought is the meaning (image, sign, status, experience, relations, acceptance, and importance). Objectivism has been replaced by subjectivism. Debord [90] refers to "the principle of commodity fetishism" which consists of the "domination of society by things whose qualities are at the same time perceptible and imperceptible by the senses" (p. 26). As George Ritzer says in his introduction to Baudrillards's "The Consumer Society", "commodities are no longer defined by their use, but rather by what they signify. And what they signify is defined not by what they do, but by their relationship to the entire system of commodities and signs" (p. 7) [87]. The postmodern world is all about image. As technology advanced, people are communicating mainly through images. They see the world as presented on TV and other media and they buy their commodities because of an image they create about themselves, as well as for the image advertisers create for them.

Coming from that rational, it is accepted that consumption determines many consumers' values and experiences regarding life and being. As McCracken [91] states, "Usually, cultural meaning is drawn from a culturally constituted world and transferred to a consumer good. Then the meaning is drawn from the object and transferred to an individual consumer. In other words, cultural meaning is located in three places: the culturally constituted world, the consumer good, and the individual consumer, and moves in a trajectory at two points of transfer: world to good and good to individual" (p. 71).

The consumption comes to be seen as a language, a "system of exchange", and as "a process of classification and social differentiation" (p. 7) [87]. This takes us to a stage that living in a commodity driven society is that all the objects need to be acknowledged and exchanged for their value, producing them is not enough. The market is definitely such a place for that purpose. To Debord [90], the commodity has turned "the whole planet into a single world market" (p. 27). The postmodern market is beyond monetary. It takes its fuel from satisfying the needs of the consumer, which, as previously said, go beyond utility but are undoubtedly present. It is true that most of them are fabricated by advertisers and marketers, but they are still very much real to the consumer and they need to be fully satisfied.

It is in this cultural framework that the proposed cultural innovation construct model presented next was thought and conceived.

3.2.3 The Four Resulting Archetypes Of Cultural Innovation Construct Process

In order to understand how culture influences the innovation creation process, we need to define which variables contribute to such phenomena. Departing from Schwartz's [92] values system, which affects attitudes and behaviors, we find two basic dimensions, based on value conflicts.

One dimension opposes Openness to Change (combining the self-direction and stimulation value types) to Conservation (combining security, conformity, and tradition). This basic dimension reflects a conflict between emphases on own independent thought and action and favoring change (open to change) versus submissive self-restriction, preservation of traditional practices, and protection of stability (conservation). The second dimension opposes Self-Transcendence (combining benevolence and universalism) to Self-Enhancement (combining power and achievement). This dimension reflects a conflict between acceptance of others as equals and concern for their welfare (self-transcendence) versus pursuit of one's own relative success and dominance over others (self-enhancement). Hedonism shares elements of both Openness and Self- Enhancement (p.124) [89].

The first dimension represents what we may call the cultural collective values, representing how people guide their lives in the "what is their collective way of living" sense, and the second represents the cultural individual values, representing how people guide their lives in the "what they do in their individual lives" sense.

Based on the cultural collective values and cultural individual values, representing the two basic dimensions of Schwartz's values system, we are able to construct a matrix, as in Fig. 3, which contains four different fields in which cultural innovation can occur through a very specific process.

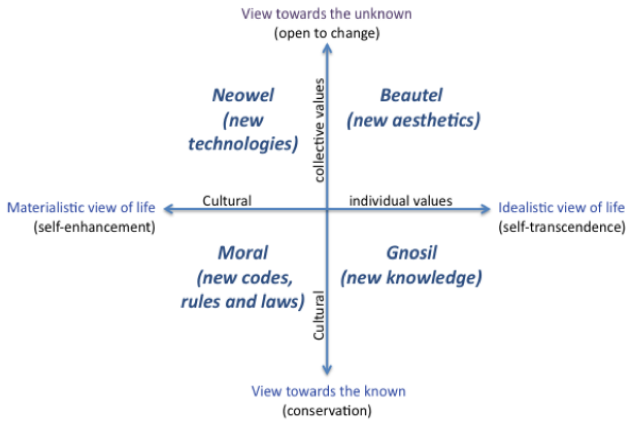

Fig. 3. Types of cultural innovation construct

A- "Neowel (Cultural) Innovation (from old English neowe, recent and different).

The drive for this type of cultural innovation is the wide creation and fast adoption of new technologies and

their applications. New technological things (products and events) induce new "created" behaviors/habits in relevant portions of the population, developing new meanings and signs. The impact of this type of innovation has a collective dimension as it creates standard behaviors at people's group level, reflecting a high capability for collective creation and adoption. In this archetype, cultural innovation is clearly induced by new technologies resulting from creativity and research, which force the adoption of new human behaviors that become part of culture.

The use of emails, as a result of the technological advance of internet and computing technologies, of cellular phones and lately of smart-phones, as a result of technological advances in the telecommunications technology, or of new cooking devices (ie. Bimby), like washing machines before, as a result of applied technological advances in ICTs to household equipments, have all created new habits in our society.

In fact, radio, cinema, TV, automobiles, airplanes, personal computers, and Internet have individually and collectively changed our culture during the twentieth century. Despite the technological advances behind each of those major innovation breakthroughs, what we can in fact identify at first glance is what each one did to our culture. Radio brought us the possibility of having news in a much faster way than before, as well as created a vast opportunity for the musical development. Cinema and TV advances completed what radio did before, adding image, color and new contents, all of cultural value, specially the cable TV that created new grounds for the appearance of alternative cultural groups. The automobile provided us with the mobility that mankind never experienced before, making possible larger commuting movements by the population, changing the way people organized their lives in terms of space and time. The airplane amplified what the train and automobile did before, adding new speed and territorial coverage. The personal computer brought us new ways for working and Internet just amplified that convenience and added new benefits in communication and information terms, creating the right environment for the appearance of new cultures and cultural groups.

B- "Beutel (Cultural) Innovation" (from anglo-french beute, and latin bellus, pretty and handsome).

The drive for this type of cultural innovation is the easy adoption of new aesthetics and their applications. New aesthetic trends reflected on products (goods and services) induce new "created" behaviors/habits in some small pockets of the population, developing new meanings and signs. This type of innovation mainly impacts the individual level, reflecting a very high capability for individual creation and adoption. In this archetype of cultural innovation, we may find that changes are induced by creative players (artists, musicians, architects, painters, sculptors, designers, etc.), maybe provoking the creation of new technologies.

New artistic styles in the field of painting (e.g. realism), sculpture, architecture (e.g. postmodernism), music (e.g. jazz, funk), literature (e.g. postmodernism), or fashion (e.g. miniskirt) are outcomes of this type of cultural innovation.

If we take jazz and rock'n'roll in the music realm, minimalism in products design, or MTV in the entertainment field, as examples of aesthetics innovations, we find that all had a tremendous impact on the creation of today's culture. Music, like any other art manifestation, is by definition one of the best natural results of cultural changes converted into an innovative form. Some of those art manifestations may only influence minor groups of the population for short periods of time, like "disco" music did during the seventies of the past century, but others last for long periods of time and have a strong influence on large groups of people, like modern architecture did to our civilization. We should note that these type of innovative events, of cultural genesis only, have a manifested impact on the creation of new products and the development of new technologies, being the recording tapes, the vinyl records, the CD, the DVD and the iPod good examples of that phenomenon related to the music culture and industry.

Many products of personal use are deeply affected by the influence of new aesthetics. The clothing fashion industry, the jewelry industry, and even the computer and the mobile phone industries are clearly influenced by the aesthetic trends of the time.

C- "Moral (Cultural) Innovation" (from latin morale, manner, character).

The drive for this type of cultural innovation is the vast breaking of old traditions through the adoption of new morals and their applications. New morals, induced by new codes, rules or even laws, force new "adapted" behaviors in the large majority of a population. This type of innovation has a strong impact at the societal sphere, forcing behaviors at community level, but reflected in a moderate and slow capability for full collective adoption. The cultural changes in this archetype may be induced by opinion makers, forced by policy makers, and introduced by social agents (religious organizations, cult groups, media, etc).

Social rules (e.g. business and social protocol), communication standards (e.g. dialect), communication forms (e.g. social networks), social behaviors (e.g. adoption of "ethic driving" principle) or writing patterns (e.g. complying with new orthographic accords) are outcomes of this type of cultural innovation.

Using the examples of vaccination, drink n'drive and speed compliance phenomena, we can identify connections between social regulations and our current cultural behavior. Independently of those being covered by regulations or not, we, as a society, have adopted them and other behaviors that are in accordance with the

principles behind such social impositions which are reflected in other activities and inter-relations with other members of society, such as more ethical driving. The "child on board" sticker on many automobiles has higher impact on other drivers' safety related behaviors when more drivers comply with speed and drinking limits. The social responsibility principals are deeply based on this kind of behavior's tendency, making it possible for many products that are more environmentally friendly to take marketing advantages of such cultural changes, especially in the household equipments field.

D- "Gnosil (Cultural) Innovation" (from ancient greek gnosis, investigation, knowledge).

The drive for this type of cultural innovation is the slow vanishing of old stereotypes through the adoption of new knowledge and its applications. New knowledge, resulting in new attitudes, forces new "adapted" behaviors in some small pockets of the population. The new knowledge refers to scientific findings that have impact on human life. The impact of this type of innovation is manifested at the personal (individual) level, reflected in a moderate and slow capability for vast individual adoption. The cultural changes in this archetype appear to be mostly induced by opinion makers and others in closed individual cycles.

Social behaviors (e.g. drivers' fairness on the roads), learning patterns (e.g. desire to learn cooking techniques), and life styles (e.g. jogging using an iPod) are outcomes of this type of cultural innovation.

All available information about the impact of some genetic transformed and processed foods on human life has changed many behaviors related to the way some small part of the western society make their choices. The growth in the number of adopters of raw food is an example of such change in behavior due to the spread knowledge of that issue. New cooking training courses for adult are in some demand due to that trend. The walkman was, like the iPod is today, probably one of the best examples of the utilization of a product to fulfill a certain cultural behavior, based upon the individual preference for an activity funded in specific life style. Gym equipments and services are based on the same want that follows a cultural attitude of a restricted portion of the population. The same phenomenon applies to other sport or out-door activities and products used for that purpose, some with strong cultural meanings.

It is possible that some scholars and professionals may consider that the two bottom quadrants must not be considered real innovation as they only represent low adjustments to an existing status quo. However, as the majority of authors currently do with product and organizational (processes, marketing methods and organizational systems) innovation, I also follow that line of thinking and, therefore, consider those as cultural innovation archetypes despite the fact that they might only represent minor changes, but still effective enough to be considered innovation.

3.3 Connecting Both Sides Of Innovation: Technological And Cultural

It is clear that many products, apart from their technological innovative side, also have a cultural innovation component. This may occur as an intentional outcome or just happens latter by pure chance as the market adopts and assigns special meaning to it.

We may take the case of the "jeans" cultural innovation in the 19th century in the US. The technological innovation (by adoption) was very limited to the use of an existing material and technique (the rivets) used for other purpose and by other industry, being the objective of the creator of jeans purely functional, therefore without any (cultural) attempt to create a new design that could induce a change in any fashion or life style. However, due to the tangible attributes of the product, it became so widely used, even spread over other parts of the world, turning into a fashion style in itself, and a cultural symbol of a certain American life style. With a higher technological innovativeness component, the Post-It Notes have gone through the same path. And at the highest technological level, the radar technological development also led to a household appliance that changed our life style - the microwave. Computers, personal computers and the Internet have been the most obvious technological innovative products that have created a profound impact on our lives and changed many of our behaviors, collectively and individually. On the other hand, cultural changes can also lead to technological innovation, as it is happening in our days with the environmental awareness of a great portion of the population and their demand for "green" products such as household equipments, cars, consumables and so on.

Those four archetypes in the previous matrix represent how society behaves according to their composition of people and to their main values systems. So, each position represents how a certain group of people will adopt innovation when facing its rising. But, implicitly, it also represents how people in each position behave when facing a need for change, consequently, for innovating. In this regard, firms will operate as a group of people and will behave in the same fashion, creating and adopting innovation. Therefore, the model can be used by firms to understand their internal potential for innovation, considering the values in their organizations, and to define objectives of impact on society for their innovative products and services.

The challenge to scholars, policy makers, professional, but mainly to business decision makers, is to find the best innovation strategy for their products and services that can lead to a great deal of value creation on both dimensions of value - tangible and intangible. This line of thought leads to the discussion of how much value can one action or event create and how much tangible

value can be related to the intangible value of the same action or event and vice versa.

That relation will affect culture and economy, as in the one hand we have ~~a~~ continuous technological development leading to the homogenization of exchange value (commoditization), and on the other hand we find a cultural categorization of the exchange value, usually in the form of closed exchange spheres, in an attempt to reach the "singularization" of value, as Kopytoff has identified [93]. This paradoxical conflict between commoditization and singularization, and technological and cultural innovation, embedded in most innovation processes, needs a profound reflection, because the final (holistic) value comes as a result of those phenomena.

4. FURTHER DEVELOPMENTS

4.1 Anticipating The Future

All needs for future research, identified next, are based on a simple premise: the future is going to be different. Speculative examples will be provided next in order to illustrate potential scenarios that we, as humanity, will face in the future.

A first set of examples will focus on technological advances that will potentially affect the existing culture.

Out of all potential futures that innovations can provide ~~us~~, 3D printing may be the technological one with the most unpredictable future results in terms of how it can influence and create cultural innovation as well. The variety of potential applications of 3D printing is so vast that imagination hardly covers it. From simple products like sandals, to very complex ones, such as artificial organs for human implant, it is feasible that 3D printing will respond to all with new and unique solutions. Out of all possible future products produced by 3D printing, some will be able to create different cultural behaviors. The same applies to production processes where 3D printing will allow for a complete flexibility of producing unique products for any slightly different situation. This product uniqueness possibility, in conjunction with a more individualistic society, will change many existing group behaviors of today, influencing the economical and industrial/labor environments.

In the same way, the "robotization" of our society via the development and utilization of robots in industrial production, household activities, services and social events, as a result of further technological innovation in time, will provide new contexts suitable for new human behaviors and, therefore, for new cultural innovations, especially at the level of inter-action between humans and machines.

The last advances in the pursue of generating free electrical power, based upon Tesla's theories and concepts, despite other technologies that intend to diminish the consumption of natural resources and avoid other environmental impacts, such as solar, wind and tide electrical power production, will take the human society to new levels of development due to almost free energy access. This will have a great impact on the economy and on the way populations are distributed all over the planet. Free electrical power will allow the geographic spread of large portions of the population carrying all technological advances with them. This will facilitate the independence of some groups of people, based upon geographic location, knowledge and other motivational factors, to generate new and closed communities with new cultural values and standards. The same freedom will reach large urban centers and will change the relations of inter-dependence between groups and classes mainly at the industrial and services realm. These advances will create new opportunities for new business with large impact on the cultural side of life like entertainment, transportation and housing.

In line with the free electrical power supplying, we may find that self-driving vehicles phenomenon will have a strong impact on our lives in the future, mainly at the cultural side of it. A technological advance of our days, it will allow people to commute and work in new ways based upon new paradigms, providing spare time for other activities. Group working during commuting time, personal resting or other activity actions, and other unforeseen benefits will be taken to a new dimension and meaning, generating new habits and cultural behaviors.

A second set of speculative examples will focus on cultural changes based upon aesthetic evolutions which will create potential fields for the emergence of new technologies.

The desire for new forms of entertainment, new in their forms and reaching novel dimensions at the sensation and emotional side of people, is quite strong in our society today. The demand for the new in this field will allow the appearance of original proposed solutions, using state of the art technologies and offering unique emotions, difficult to equal or imitate. Entertainment foregoes along with cultural changes, and new trends in this field will provide insight clues of the cultural changes, current and ahead.

Following the same fundamental base of entertainment, because it is part of it, games and the gaming industry are subject to constant mutations, now and in the future. These changes are part of a constant research that the industry forgoes in order to satisfy new trends and new requisites of consumers in that specific field. Sometimes it is difficult to determine if it is the culture that influences the creation of new games and technologies in the field, or if it is the case of an opposed causal relation. In fact, games are part of new cultures, especially among the youngest, influencing many other behaviors of the members of certain cultural groups. The use of this industry to create new cultural behaviors is quite obvious, despite the need to identify and qualify such phenomenon.

Toys follow a very similar fundament to the entertainment and gaming cases, which justifies no need to discuss the issue any further, but only reinforce what has been said previously.

Communications are the kind of innovation, basically based upon technological advances but with strong impact on the cultural side of society, which we may not be able to understand at first glance. The reason being that we never know where the communicational innovation action or event has started and has finished or if it hasn't finished yet, which makes our attempt to understand it even more difficult. However, we may define as certain that communication technologies and behaviors are one of the strongest drivers for cultural innovation. The future is so uncertain that any speculative vision of it will be certainly partially wrong. That does not mean that we should not keep a very open eye in relation to any communicational changes or advances, if we want to keep pace with the cultural changes that it will imply.

A third set of speculative examples focus on behavioral changes that are forced by new codes or regulations, influencing the adoption of new or different technologies.

National security needs in many countries since 9/11 has introduced new regulations, applied to cross-country travelers that have created new procedures for those. This new reality has forced travelers to adopt new behaviors regarding luggage content and airport movements. In fact, the way aviation passengers behave today, as far as complying to legal procedures and following authorities instructions is concerned, is quite predictable and homogeneous. This new culture has contributed to a much higher level of awareness of passengers who behave outside the new standard, being identified as belonging to undesired, dangerous or threatening people.

The same applies to public safety procedures, which has introduced complex controlling networks in many public buildings and even cities' areas, such as video cameras and others. This new environment has forced many people to adopt more constrained social behaviors.

The pursuit for human longevity and wellbeing, supported by regulations and actions in the public administration domain, has taken many people to adopt certain regular procedures like regular vaccination and health controls, apart from other behaviors related to the self-investigation and learning of how to live their lives in equilibrium, as we will refer to next. These behaviors, supported by a quite common induced attitude towards human longevity and wellbeing, created the need for the production of equipments for personal use to control health indicators like blood pressure and others. The more generalized spread of those equipments among older populations comes as the result of a new cultural behavior, originated in causes far from the reasoning of the final users. This tendency will be widened to other products that we will see in the future.

The fourth, and final, set of speculative examples focus on behavioral changes that are originated in investigation and learning of what behaviors people should adopt.

Personal production of agricultural products is becoming a solution for many peoples' worries regarding health, environmental sustainability and personal independence of economic systems. Groups of people adopting their own agricultural production, even partially, are emerging in many places in western countries, taking advantage of the Internet shared communication and learning, acting either at individual level or communal level. This new attitude will take many people to join new communities outside the standard or common society. Food production methods will be questioned and new technologies will be desired, opening room for many innovations in this field.

Many different and new food products based on natural or biological resources and non-manipulating processes are becoming more commonly consumed among the younger generations. This new consumption attitude, against what has been mostly seen in the last century, will generate new solutions in many areas of the food industries.

Personal security is creating a new industry based upon the demand for equipment and surveillance systems that can operate in any place on earth. This tendency will generate new habits in our society, especially in the youngest and oldest fringes of the population, allowing for new forms of interactions and geographical orientation.

4.2 Implications For The Construct Model

It is clear that this paper leaves more questions than it has provided answers. It is evident that there is a strong necessity to identify how technological innovation (product and organizational) affects culture and how cultural innovation affects technological innovation. But, mainly, we need to find how cultural and technological innovation affects the economy and the different stakeholders involved in a given event. More research on the interconnections between tangible and intangible value, related to technological and cultural innovation, and development of some evaluation methods and tools are needed in order to support political and business decisions in an increasingly complex environment.

Therefore, there is a strong need to validate the proposed construct model, in its technological and cultural dimensions, and to understand what kind of inter-relations and co-relations, if any, exist between the types of technological process innovations and the types of cultural process innovations. Further research needs to be completed.

4.3 The Role Of Attitude And Behavior Changes In Economics

We may also find pertinent that further research has to be done in the realm of economic science to understand the impact of attitudes and behavior changes, despite the extended work already developed by the discipline of behavioral economics. There is a clear need to understand why some events generate much more "value" than others, when all seem very similar. We may need to separate events from environments and contexts, as they might condition each other, to understand their construct, and mix them back, forcing all to interact among them, to understand their impacts on human society.

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