

INDUSTRIAL DESIGN, CREATIVITY AND IDEATION. A PRELIMINARY STUDY OF PRODUCT DEVELOPMENT WITHIN THE MANUFACTURING SECTOR OF BIOBIO, CHILE

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Abstract: Creativity and ideation within industrial design, when applied to productive contexts, can be key for regional businesses looking to achieve product differentiation and competition in the globalized marketplace. The Bío-Bío region of Chile is recognized as a major manufacturing centre, historically known for its production and manufacturing industries. Nonetheless, the degree to which creativity and ideation are incorporated into industrial design in the development of new products is largely unknown. The present preliminary study, which surveys 17 manufacturing businesses in the region, demonstrates that while on a regional level creativity and ideation are present throughout product development, these practices often manifest as a result of external demands from clients or competition and do not necessarily form part of an integrated and proactive strategy for innovation. The present analysis identifies the lack of integration of creativity and ideation within industrial design, particularly in the context of regional production.

Key words: Applied creativity, Ideation, Industrial Design, Regional Manufacturing Industry, Chile

1. Introduction

Creativity and innovation have been “diagnosed” as remedies for sustained growth in an increasingly competitive and globalized market. Industrial design is a field that may help to facilitate and guide creative processes—from idea generation to the materialization of new products. When used in the manufacturing sector, it can help businesses achieve differentiation and competition. Indeed, “the ‘application’ of creativity in the product development context is – what in industry usually is agreed upon as the origin of innovation – by large the determining factor for the survival of companies in the today’s highly competitive environment” (Brockhus et al., 2014). Various disciplinary approaches and techniques to address the generative processes in product development and design appear as ideal theoretical references (Briede et al., 2014) which are not necessarily consistent with the socio-technical and cultural realities of a country such as Chile, where development is guided by a free market model based primarily on commodity exploitation and the intensive extraction of natural resources (López & Miller, 2008). The present study is situated in the context of the Bío-Bío region,

which is characterized as a major manufacturing centre—home to large-scale producers of raw materials and manufacturing industries that assemble footwear, glass, textiles and metal work, among others. Many of these industries, however, are not known to utilize design in a conscious, systematic or even strategic matter. Tony Yu (2004) refers to Hong Kong-based manufacturers as “business guerrilleros” who participate in collective processes of discovery, attempting to fill the void created by industrialized economies (171). This situation resembles that of SMEs in the Bío-Bío region, which seek to conform advanced technologies and procedures to a relatively precarious context. The following preliminary study examines the manufacturing industry in the Bío-Bío region of Chile. It seeks to better understand the incorporation of creativity and ideation in industrial design throughout product development, the ways in which creative and productive stages of product development are approached, as well as the methods utilized and personnel involved in such processes. This study is part of an ongoing, *long-term* research study that analyzes the extent to which design and creative processes of ideation are incorporated into product development and manufacturing. The overall objective is to understand current practices and propose models for better integration, keeping in mind the need for incremental and sustainable changes within local industrial practices.

2. Study Context

Rankings of national productive importance in Chile list the Bío-Bío region as having the second largest number of metal and non-metal manufacturing businesses in the country, with a total of 10,143 (SII, 2014). The Metropolitan region tops the list with 41,795 businesses while the Valparaíso region takes third place with 8,393 businesses. When considering annual sales (total sales/total number of businesses), the Metropolitan region displays the highest annual earnings with US \$2,275,480.83 per business, while the Valparaíso region comes in second with an average of US \$1,837,379.79 per business. The Bío-Bío region ranks third with average earnings at US \$823,066.97 per business.

Therefore we can infer that the large quantity of manufacturing businesses in the Bío-Bío region does not necessarily correspond to high sales volume, perhaps pointing to competitive shortcomings on a national level. On the one hand, the Bío-Bío region is characterized as a major manufacturing centre, historically known for its wide range of industries. The Index of Regional Economic Activity (INE, 2013) shows that the manufacturing industry of Bío-Bío has grown in the third quarter (July-September) of 2013. Moreover, according to the Index of Regional Competition CEEN-2012 (CEEN ICORE, 2013), the Bío-Bío region is ranked 10 out of 14, keeping in mind that the principal challenge for regional economies is expanding the potential for growth and reducing dependence on raw materials (Economía & Negocios, 2012). On the other hand, and at the expense of the manufacturing sector, regional actors have been unable to “consider regionalism” (Rojas, 2002), thus limiting joint development. In fact, among universities in the city of Concepción in the Bío-Bío region there is no clear network of actors working collectively towards development (Galabella & Gatica, 2014).

3. Creativity and Ideation Applied to Industrial Design

According to the United Nations, manufacturing industries are defined by “the physical or chemical transformation of materials, substances or components into new products,” although this is by no means the “only or universal” definition (ONU 2009). In this context, industrial design serves to optimize the usability, function, value and appearance of products and systems, thus improving product differentiation and, as a result, consumer interest (Hertenstein et al., 2005; Swan et al., 2005) for the mutual benefit of both consumers and manufacturers (IDSA, 2010). Creativity is considered to be part of the innovation process and is oriented towards generating new and practical ideas (Ford, 1996; Maier et al., 2001) through a process by which an individual uses his or her capacity to generate ideas, solutions and products that are both new and valuable (Sarkar & Chakrabarti, 2011). Concept

generation, also referred to as “ideation,” is an essential process in developing innovative designs (Yilmaz et al., 2013) through the use of sketches and evaluation aimed at exploring design ideas (Adams, 2012). With regards to creativity applied to productive regional settings, differences in regional performance and growth over time cannot be explained by differences in the quantity and quality of productive factors alone (Sleuwaegen & Boiardi, 2014). Rather, the unexplained variation between regions has been associated with the (imperfect) work of three processes: innovation, an entrepreneurial spirit for impact, i.e. companies’ ability to create new jobs, and internalization (Devoldere & Sleuwaegen, 2006). For the most part, assessments of creativity in product design are based on the end result rather than the actual process of design wherein creative ideas are generated (Yuan & Lee, 2014). Studies have shown that both individual creativity and a creative environment have positive effects on business innovation. These findings emphasize the importance of enabling a creative environment for employees in order to encourage and boost creativity while ultimately increasing the capacity for innovation within a given business (Cekmecelioglu & Günsel, 2013).

4. Research Methods

In order to better understand how businesses in the Bío-Bío region approach creativity and ideation in the development of products within industrial design, an exploratory study (Creswell, 2003) was carried out by applying a triangulation of quantitative and qualitative methodologies (Bericat, 1998). As part of the quantitative phase, a pilot survey was administered using a non-probabilistic convenience sample (Hair et al., 2009) of 17 manufacturing businesses in the Bío-Bío region which were interested in participating in the study—classified as micro, small and medium-sized businesses. Productive sectors represented in the sample include producers of agricultural and forestry machinery, furniture, wood products and derivatives, metalwork and general machinery. The following topics were addressed: design, the creative process (wherein ideation allows for the development, visualization, exchange and evaluation of innovation and utility of “ideas”) and the role of clients and users in the creative process. As part of the qualitative phase, survey data was triangulated with a focus group comprised of 8 businesses and academics from across the region, which covered the same topics.

Exploratory research was carried out initially with the aim of obtaining a preliminary analysis on the question at hand, which would thus serve as a basis for future hypotheses. Data analysis included a statistical descriptive analysis of the quantitative phase and qualitative results using open coding following the guidelines of Grounded Theory. Among the 17 questionnaires, information was sought regarding the particular business, governing information, incorporation of design, ideation process, management and documentation, product characterization, productivity and information technologies. Data recollection was carried out using a survey that incorporated both open-ended and closed questions.

The following is an extract of 2 sections of the survey. Out of a total of 44 questions, 19 questions that were most relevant to the present study were selected. It is important to mention that all questions are linked to alternative responses, which are associated with contents from the State-of-the-Art Review and focus group.

Table 1. Survey Questions

8 [dis001] Which of the following activities take(s) place in your business?
9 [dis002] Does your business have a design strategy? *
10 [dis003] From where does the need to launch new products originate? *
11 [dis004] How are design activities perceived within your business? *
12 [dis005] Has your business worked with professional designers and/or design students in the past 5 years? *
13 [dis006] If yes, what was the benefit of this collaboration? *
14 [dis007] Who is/are responsible for initiating new product design? *

15 [dis008] What strategies are utilized for designing new products in your business? *
16 [dis010] How much time is dedicated to creativity or ideation during the overall product development process? *
17 [dis009] Who is responsible for the creative process? *
18 [dis011] Which of the following factors impede(s) the incorporation of design within your business?
19 [dis012] When no designer is present, who assumes the function of designer within your business?
20 [dis013] Who participates in the design and development of new products? *
21 [dis0014] What impact do the following criteria have in assessing the results of creativity and ideation? *
22 [Id.001] Of the following, which are characteristic of product ideation? *
23 [Id.002] Which spaces are utilized for carrying out creation and ideation? *
24 [Id.003] The visualization of ideas is developed... *
25 [Id.004] How do clients participate in the design process, particularly in the development and selection of an idea? *
26 [Id.005] Is the user considered during the ideation process? *

5. Results

Given the characteristics of the sample, survey results are not representative of the population at large. Results correspond to a non-probabilistic or biased sample, and despite the fact that a non-probabilistic sample has the same selection criteria as established for the survey, the analyzed sample provides general results which help to identify certain trends for the final study. It is important to note that percentages for each question do not add up to a total of 100%, seeing as there are multiple responses and multiple categories. Rather, percentages represent the most valued or selected response, and each option within a given category can total 100%. The results are organized according to the 9 themes.

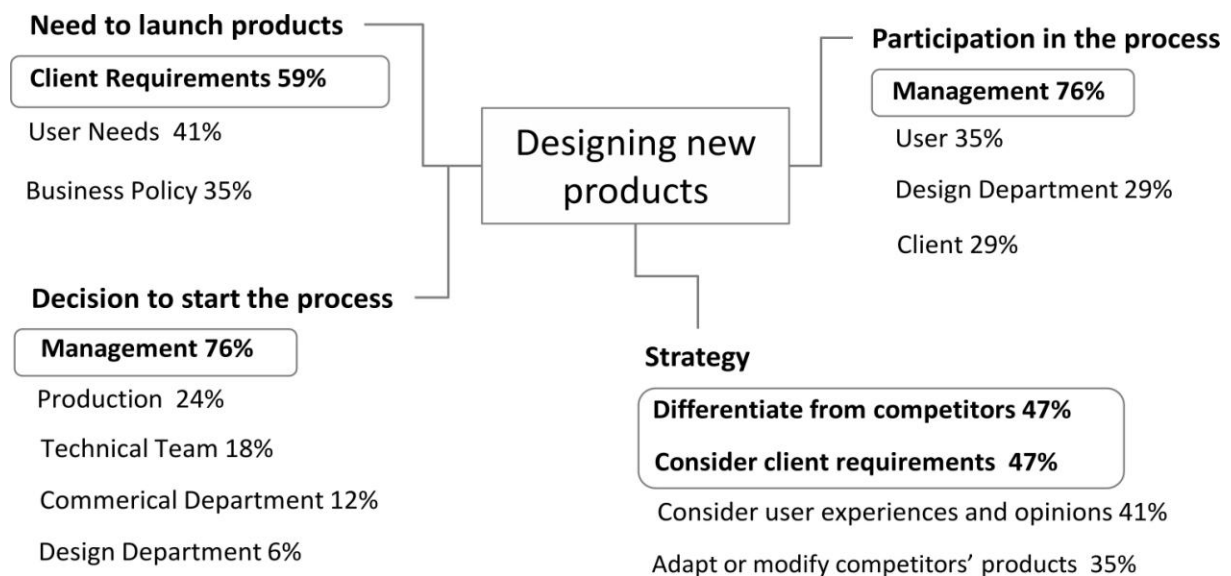


Figure 1 Survey Results on Design of New Products

Data from Figure 2 is consistent with results from the focus group, where the decision to initiate product design was taken primarily by management. Specific client requirements are also considered, and frequently large companies with considerable purchasing power sway the design process.

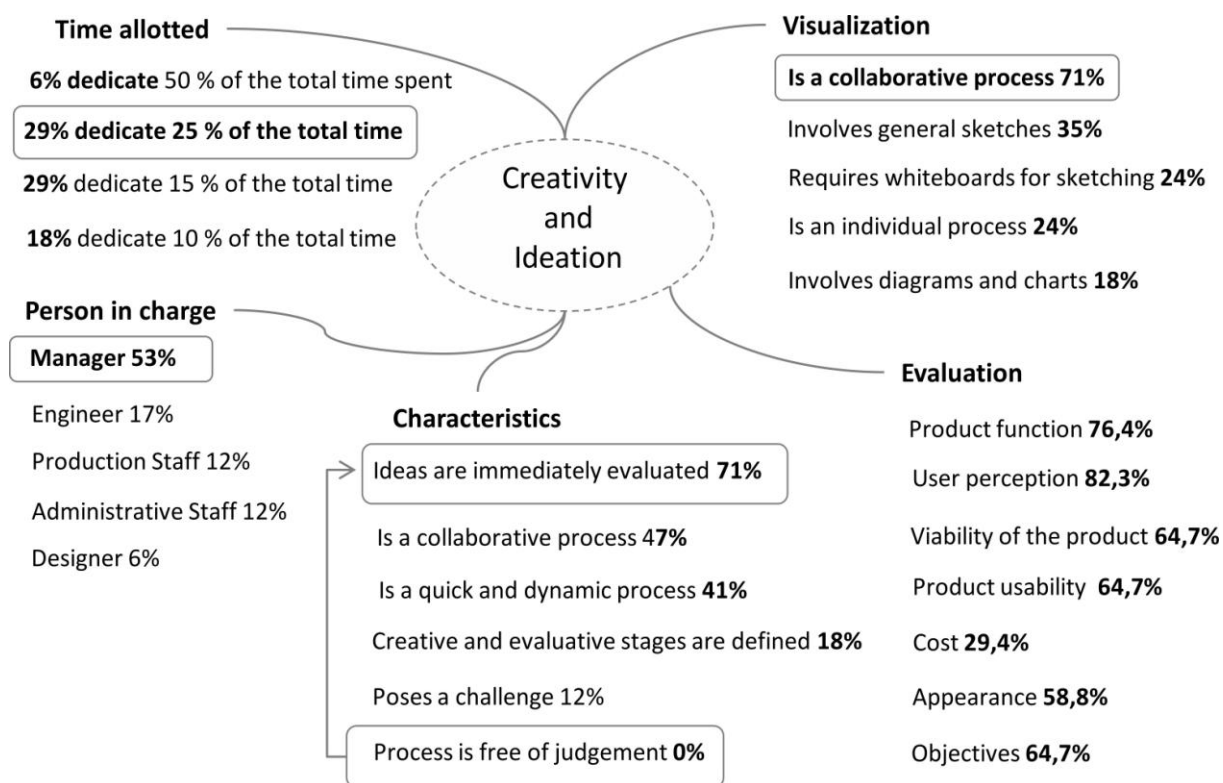


Figure 2 Survey Results on Creativity and Ideation

The creative process and ideation: The above information displays qualitative results from the focus group, which show that the creative process is centred on reproducing successful foreign products rather than generating new ideas. With regards to the quantitative study, survey responses to the question “What strategies are utilized for designing new products within your business?” highlight that while copying is not a highly regarded strategy, adapting products from competitive businesses is a common illicit practice within the development of new products.

Actors responsible for the creative process: A recurring trend in the decision to lead product development shows that managers take responsibility while using client requirements to initiate the process. The design team has a minimal role.

Criteria for evaluating creation and ideation: Participating businesses consider functionality and user perception to be the most influential criteria in the creative process, while the least important criteria are product viability, product life cycle and cost. The first set of criteria is confirmed by the focus group, as well as the lack of long-term analysis on product quality. Nonetheless, product viability and cost were considered to be relevant during the qualitative phase.

Characteristics of the process: The most important characteristics of ideation are that “ideas are evaluated immediately” and in a “collaborative” manner. This highlights the importance of meeting client demands rather than developing a solution to a concrete need, which was evidenced in the focus group. Nonetheless, while the survey defines ideation as a collaborative process that is open to dialogue, this does not speak to the actual distribution of responsibilities, which was perceived to be minimized during the focus group.

Visualization: According to the most frequent responses among surveyed businesses in the Bío-Bío region, the visualization of ideas is a “collaborative” process wherein “general sketches are drawn,” “whiteboards are used for sketching possible solutions,” and the process is sometimes carried out

individually. The use of low-cost intangible representations versus physical prototypes (which are infrequently used) reaffirms the low investment in design identified by the focus group, as well as the low level of complexity of the design process, which is aimed at producing copies or readapting existing products.

Client participation: In the design process, and particularly the development and selection of ideas, nearly half of surveyed businesses state that the client participates in the process in a “participative” manner, or in a way that provides crucial information related to the use of a new product. In the focus group, however, the client was able to dictate specific characteristics of a request, and his/her power was directly relational to the size of the business. In this regard, the survey did not allow us to see whether the role of the client varies according to business size.

User participation: One-third of surveyed businesses actively involved the user in the ideation process for “evaluating and approving alternatives.” There are a few discrepancies when comparing these results to the focus group. On the one hand, clients affiliated with forestry and mining companies often handle orders and are users themselves. As a result, their participation may be understood as that of a client or a user. On the other hand, designs requested by businesses are at times pre-defined and historically part of the resources employed by each industry. This may explain why the user is not considered during the creation process. Finally, the low level of user participation may be due to the lack of importance assigned to research in the design process, which is seen as an additional expense or simply irrelevant.

The surveyed businesses provide us with insight into trends regarding ideation in product development, which is characterized as a collaborative process wherein ideas are immediately evaluated. The client takes an active role in co-creation, while the user acts as an external agent who evaluates and approves alternatives. Moreover, while ideas are immediately evaluated they are often judged, which not only thwarts the creative process but also inhibits the creation of a *space* where ideas are allowed to come to fruition.

6. Conclusions

Creativity and ideation are clearly incorporated into the industrial fabric of manufacturing businesses. Nonetheless, these processes are not associated with a specific discipline or team within the business and become the responsibility of *management*. The creative process and ideation are carried out from a collaborative standpoint, considering elements unique to a given business (administration, technical team) as well as the client, and in some cases the user and the design team may be involved in the development of specific projects.

A preliminary analysis of the local context demonstrates that creativity and ideation are present throughout product development, usually as part of a reactive strategy (taken in response to external input by clients, competition, etc.) as opposed to an integral and proactive stance aimed at harnessing innovation. Thus, when analyzing the impact of creativity aimed at innovation, it is clear that creativity leads to the production of useful or beneficial ideas, though not necessarily new ideas, which is not commensurate with innovation.

Further study will include businesses whose activities cover the wide range of industries present in the Bío-Bío region. In addition, it will provide insight on significant correlations between product development and creativity and innovation.

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