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Towards strategic design: the experience of two Colombian MSMEs

Vanessa Segura-Duque [a] | Gabriel García-Acosta [b] *
Lina María Peñuela-Delgado [c] | Karen Lange-Morales [b]

[a] Ergofactos S.A.S., Innovation & Development: Bogotá, Colombia
[b] Universidad Nacional de Colombia, School of Industrial Design: Bogotá, Colombia
[c] COINTEC S.A.S., Marketing: Bogotá, Colombia
* Corresponding author: ggarciaa@unal.edu.co

ABSTRACT

This qualitative-interpretive study reflects on the experience of two MSMEs that adapted rapidly to meet the need for protection products and maintain their production in the midst of confinement decreed by the city and country authorities, as a containment measure for the pandemic caused by the Covid-19, and where design was a key factor. The different experiences are organized taken the Product sociotechnical Cycles (PstC) model as a conceptual basis, analyzing the case studies from the organizational capabilities of industrial design, as well as from design-driven innovation. The article ends by summarizing the learnings, emphasizing the value of design with a strategic focus, in these processes of change.

Keywords: Covid-19, Product Development, Facial Protection Elements, Organizational Capabilities, Innovation.

INTRODUCTION

The Covid-19 disease caused by the worldwide spread of the SARS-Cov2 Coronavirus took everyone by surprise. Colombia was no exception and a few weeks after the confirmation of the first cases, the first lockdown was decreed. The vast majority of companies had to stop activities, re-think and adapt themselves to the new condition. Some companies were able to continue working, while others chose to send their workers on vacation, then suspend contracts, later fire people, and in many cases, closed their businesses, either temporarily or permanently.

Two companies in the manufacturing sector that reacted immediately to this situation were Ergofactos S.A.S. and Cointec S.A.S. The first is a microenterprise dedicated to the design, production and marketing of products and services aimed to improve the working conditions of people in different sectors, while the second is dedicated to the design, manufacture and marketing of injection steel molds and plastic products, as well as the injection service. Both companies created new product lines that would allow them to continue operating, while offering an ad hoc product to mitigate the spread of infection. What factors influenced the companies' ability to react? What problems did they face and how did they adapt? Those are some of the questionings that have led to the primary question of the study: What is the role of design in business to boost the organizational and innovative abilities, facing unexpected changes, such as those generated by the pandemic? This article is outlined into four parts. The first introduces the method of the case analysis.

The second part demonstrates the case studies, while the third section shows the analysis of the experiences in operation of the defined variables. The article closes with the lessons learned and the main conclusions, while setting out future studies.

1. METHODOLOGICAL APPROACH

This is a qualitative-interpretive study that is founded on two business case studies that involved design in a strategic manner, including directly from professionals of the companies that participated in the decision-making process. The study was conducted in three phases. The first consisted of the description of the experience of each of the businesses in conceptual terms of the Product Sociotechnical Cycles (PstC) model (García-Acosta and Lange-Morales, 2020; García-Acosta, 2016). In the second phase, the case studies were analyzed from two perspectives: the organizational abilities related to design (Aguilar & Hernández, 2012) and innovation (Na, Choi & Harrison, 2017). In the third phase, starting with the case analysis, concludes the guiding lessons from the research question, which are organized in learning lessons and conclusions.

2. CASE STUDIES

The studied companies worked on three elements of facial protection. Ergofactos developed masks for public use (see http://www.ergofactos.com/), while Cointec developed face shields (see https://cointec.com.co/) and safety goggles for facial and eye protection, taking the specific requirements in the health sector into account. Figure 1 presents each of the products.

Figure 1. Analyzed products.

The companies' experience in the design and development process of their products is described below, organized in the phases proposed in the PstC model (García-Acosta, 2016; García-Acosta & Lange-Morales, 2020). This model proposes three stages: origination, transfer, and destination, and includes seven phases: vision, concept, development,

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production, marketing & logistics, use & services, and disuse & support. There are different processes carried out in each phase, which vary greatly depending on each company.

2.1.The experience of Ergofactos

This company experienced a decline in demand for its products but never stopped its production, since these are requested by the floriculture sector and this group of companies were not submitted to the confinement regulations. However, mobility restrictions, confinement and not having access to the facilities involved a significant change in their operation. Tables 2, 3 and 4 summarize the most important milestones of their mask design and development experience.

Table 1. Experience of Ergofactos in the Origination stage

Phase	Processes	Description
Vision	Strategic purpose	In line with the values of the company, especially ethical performance, the process started with the desire to participate in the search for solutions to address the pandemic. The first interest was to develop a product focused on those sectors of the economy that did not cease their activities (such as perishables industry where the floriculture and food industries are located), and that as foreign to the health sector should not use masks N-95 or disposable facemasks, for their use is privileged to doctors and nurses involved in patient care.
	Stakeholders' aspirations	• Maintain the livelihood of the company's employees, with the awareness of caring for their families. • Contribute to the health care of the working population, and their need for protection against a new biological risk. • Use the socio-technological resources available to the company to supply a scarce product in a period of crisis. • Keep collaborators active to prevent psychosocial risks associated with the new life condition.
Concept	Diagnosis / problem / opportunity	Proposals were developed based on the technologies available in the organization. The company's network of stakeholders was maintained, but with the imminent risk of contagion by COVID-19, they were kept in confinement and preventive isolation throughout the development of the product. This forced them to perform isolated but interconnected processes for transmitting information, decision-making, transportation of raw materials, samples and prototypes, and sourcing and procurement activities. Figure 1 shows the relationships between stakeholders and the difficulties faced.
	Requirements and determinants	Ideas and alternatives were presented through sketches and models in 2d and 3d tools (see figure 2). The meetings were held virtually. The values of the organization were taken into account in the concepts proposed (i.e. high-quality service, responsible design with the environment, and the strengthening of networking, see figure 2).
	Pre-concepts, ideas and alternatives	Decision making was oriented to: • Privilege product alternatives that could be manufactured during the pandemic period, with all the economic, mobilization, and resource scarcity implications that this entails. • Favoring alternatives that could be easily established in the market and in the shortest time possible. • Prioritize alternatives that promote an agile production response and that are also consistent with the production capabilities of the operators. • Benefit alternatives that involve new or known processes, but with low cost of implementation.
Design and development	Detail design	The detailed design was carried out taking the guidelines issued by the Colombian Ministry of Health and Social Protection and the recommendations of the FNOS as reference (French National Organization for Standardization) regarding the following aspects: Materials, sizes, manufacturing process, packaging, cleaning and disinfection of areas, among others.
	Prototypes / validations	32 models and prototypes were manufactured where the characteristics of the product were evaluated and modified to ensure that the supplies and materials available in the market fulfill with the desired protection quality. In the validation process, materials were tested to verify that they effectively prevented the passage of particles through different layers and provisions. Figure 3 illustrates one of these tests.

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Phase	Processes	Description
Production	Process / technology development	The production sheets were delivered to the collaborators to start the production of the series of masks, with the respective manufacturing specifications, size of materials, and order of assemblies. They were also trained in biosafety protocols and the adequacy of their working place to meet hygiene requirements. Another intervention consisted in purchasing machinery to pack and seal bags, with the required adaptation of the working place.
	Parts manufacturing	It was easy to execute. The production was done simultaneously with the marketing and logistics stage, this was due to the speed with which the growth of the pandemic lead to act.

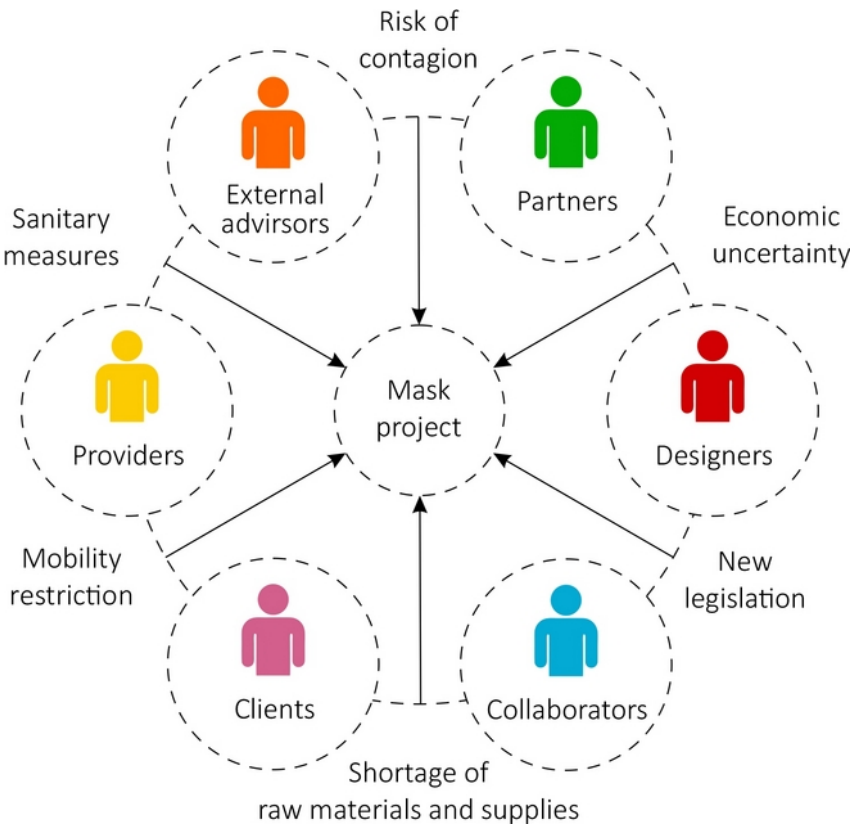

Figure 2. Stakeholders and difficulties of the COVID-19 context.

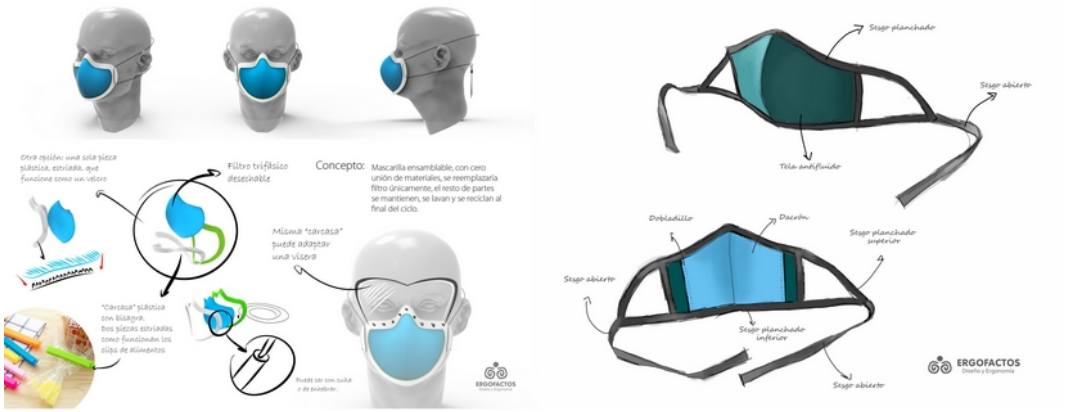

Figure 3. Sketches of design alternatives.

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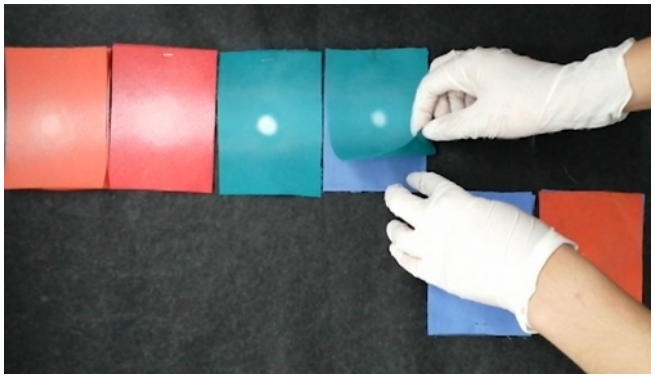

Figure 4. Materials testing.

Table 2. Experience of Ergofactos in the Transfer Stage

Phase	Processes	Description
Marketing	Packaging	This process was solved during the production process itself, taking into account the need to deliver the sealed product to the end-user, in order to avoid contamination during transport.
	Display and supply	Marketing processes were referred to the company's digital platforms and website. The first to know and adopt the masks were the company's regular clients, who maintain a long-standing business relationship.
	Distribution and transportation	This process implied a great challenge since the demand for dispatches that transporters are dealing with made the operation difficult and slowed down delivery schedule.
Procurement	Sale / purchase	The company was not used to retail, which led to the implementation of another distribution channel, modifying the administrative and logistics processes.
Incorporation	Instruction and training	To help with the adoption of the mask by the user, each package is delivered with a use and maintenance guide that educates users and encourages the use of the mask while teaching how to care for it.

Table 3. Experience of Ergofactos in the Destination Stage

Phase	Processes	Description
Use and services	Supplies / provision	Filter packages are offered to replace the original mask filter to ensure product effectiveness.
	After-sales service	As it is done with the rest of the company's products, the product was monitored, seeking to maintain quality, evaluating customer satisfaction, and then incorporating product improvements if necessary.
	Feedback to previous processes* (design and development / display and supply)	One of the characteristics that the company found was necessary to modify was the size of the mask; although the guidelines of the aforementioned guides were followed, it came out to be small on some faces. For this reason, three sizes were quickly developed and short usability tests that had not been done at the design and development stage were conducted. This modification improved the experience of use greatly and fortunately, it did not affect production rates. This change also involved an adjustment to the website as well as in all the advertising material used in the sale of the masks, which from that moment on were offered in three sizes, two for adults and one for children.
Disuse and support		Until now there has been no support in the disuse of the product, since it is a mask that must be handled as biological waste; in this regard, users were only instructed on their correct disposition in the use and maintenance guide. Regarding the leftover materials from the production or scrap process, the company maintained its policies for the best use possible of raw materials and recycling.

The feedback processes are not exclusive to the destination stage, but are of vital importance in the narration of this experience.

2.2.The experience of Cointec

This enterprise limited its operations to ongoing injection services. The lockdown also reduced their products' commercialization. This situation forced the company to quickly think of solutions to remain active in the market. Tables 5, 6 and 7 summarize the most important aspects of the adaptation of Cointec to this new reality.

Table 4. Experience of Cointec in the Origination Stage

Phase	Processes	Description
Vision	Strategic purpose	Due to the fact that the company had to stop operations and close by order of the government, the company management analyzed what were the possibilities of reactivating operations and what would be the dynamic with the work team. For Cointec, the most important thing is human resources, which led them to take a strategic turn based on design to be able to start operations and have a product that would generate income during this pandemic, and at the same time, allow them to respond to the call to solidarity made by the National Government, in which it asked Colombian manufacturers to create products for the contingency.
	Stakeholders' aspirations	• Keep the company's production active. • Generate income during the pandemic. • Answer the call to solidarity from the National Government for the creation of products for the contingency.
Concept	Diagnosis / problem / opportunity	Cointec integrated innovation and design models to identify the capabilities of the company and from there, resolve how to reach a strategic reconfiguration to reorient the portfolio, working the four stages of integration: observation, analysis, synthesis and execution. The observation took into account the entire logistics chain *i.e.* the portfolio of suppliers and the motivation and culture of the organization, as well as organizational productive capabilities in design, R&D, market for the development of these new products, and the ability to manage resources and production for the creation of plastic products. The generation of a new anti-fog system and a unique production process, allowed the integration of various characteristics to the product in a single process.
	Requirements and determinants	In the face shield, the safety associated with the anti-fog system, protection against micro-drops, flexibility of adjustment of the element, resistance to impact and rapid manufacturing prevailed. The following requirements were added for the safety-goggles, based on interviews and consultancies of various health professionals, as well as a benchmarking of existing products: fit to the face without causing injury and possibility of use together with formulated glasses and half-face masks.
	Pre-concepts, ideas and alternatives	Design alternatives, sketches and models were generated to arrive at the ideal design. These alternatives were evaluated under the existing capabilities and the appropriate materials, in order to generate the adequate characteristics, emphasizing the evaluation of the materials since they had to comply with the specifications of both the national production and those of other countries, which it wants to reach.
Design and development	Detail design	Sizing and shape tests were carried out on different materials and processes available, which led to the selection of the following materials: polypropylene, polystyrene, silicone, PET and polycarbonate.
	Prototypes / validations	In the face shield, 3D prints were made and tested with internal collaborators, verifying distances and possible conflicts when used with other elements (glasses, masks). The process of safety-goggles, that necessarily required a process of greater fit tests, lead to the proposition of a test plan with the respective verification protocols, which is currently in process.
Production	Process / technology development	The production of the face shield required two molds, one for the headband and another for the upper cover, as well as a PET sheet to subsequently assemble the product. In the case of the production of the safety-goggles, the use of the existing headband mold and a visor mold are required, all of them manufactured in-house.
	Parts manufacturing	The entire injection, assembly and packaging process is carried out in-house.

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Table 5. Experience of Cointec in the Transfer Stage

Phase	Processes	Description
Marketing	Packaging	This process followed the company's established standards, but an individual packaging was implemented.
	Display and supply	Three sales channels were used to promote the products: Marketplace, institutional channels based on online marketing and a database developed to reach the corresponding commercial target for each product. Finally, the final customer who is contacted through our page and social networks.
	Distribution and transportation	An agreement was made with a transporter with low-capacity vehicles, which also managed the new line image as a way to position the brand and provide a direct connection with customers.
Procurement	Sale / purchase	To contact clients, established digital channels and telephone are used, offering advice before the purchase, and agreeing a mix service that includes product and transportation.
Incorporation	Instruction and training	Use instructions are sent together with the product. They indicate the user the best way to properly manipulate these elements.

Table 6. Experience of Cointec in the Destination Stage

Phase	Processes	Description
Use and services	Maintenance	One year warranty is offered.
	After-sales service	Post-sale monitoring is done in order to identify how the experience with the product goes on.
Disuse and support		If any part is damaged when using during first weeks, customers can exchange it for a new one. In this case, the client sends the damaged part to the company's facilities and then he/she will receive, besides the new part, a discount. With this process the client will get a longer product life.

Figure 5. Models of design alternatives.

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3. ANALYSIS OF EXPERIENCES BASED ON ORGANIZATIONAL CAPABILITIES AND INNOVATION RELATED TO DESIGN

Two perspectives were considered: organizational design capabilities (Aguilar & Hernández, 2012) and the spectrum of design innovation (Na, Choi & Harrison, 2017), because they characterize design and innovation issues specifically in manufacturing companies and are

applicable to MSMEs; besides, they are also oriented towards capacity building and have a holistic vision.

3.1.Analysis of experiences from design capabilities

Aguilar and Hernández (2012) allow us to understand that capabilities are the know-how and that dynamic capabilities imply learning to permanently know-how. Following this approach, the two companies, through the design and development of new products, were able to continue their activities, obtaining at the same time updated knowledge related to the new market segment that, in the midst of the contingency, they selected to work with. In both cases, this showed dynamic capabilities to detect specific niches: Ergofactos targeted the general population and Cointec focused on healthcare personnel. This was done early and in a record time, taking all their organizational capabilities towards inner reconfigurations that allowed them to adequately reach these new niches, by identifying the needs of the end customer, which means to understand their lifestyle, well-being and expectations.

Cointec applied these design capabilities building a network of relationships with external agents to the company such as doctors, anesthesiologists and nurses who provided information on design requirements, and undeniably, allowed to reach an understanding of the evolution of current sociocultural models. The company also created a brand for the health sector looking for the recognition of the new set of products. In the case of Ergofactos, the previously established network of relationships was strengthened and was a key aspect to go ahead with the design, production and distribution of the new products, even with all the members of the company being in different places.

Additionally, in both cases, the new products were articulated to the internal and external vision, applying current technological knowledge and generating additional ones, all this based on the design as a key factor of the whole experience.

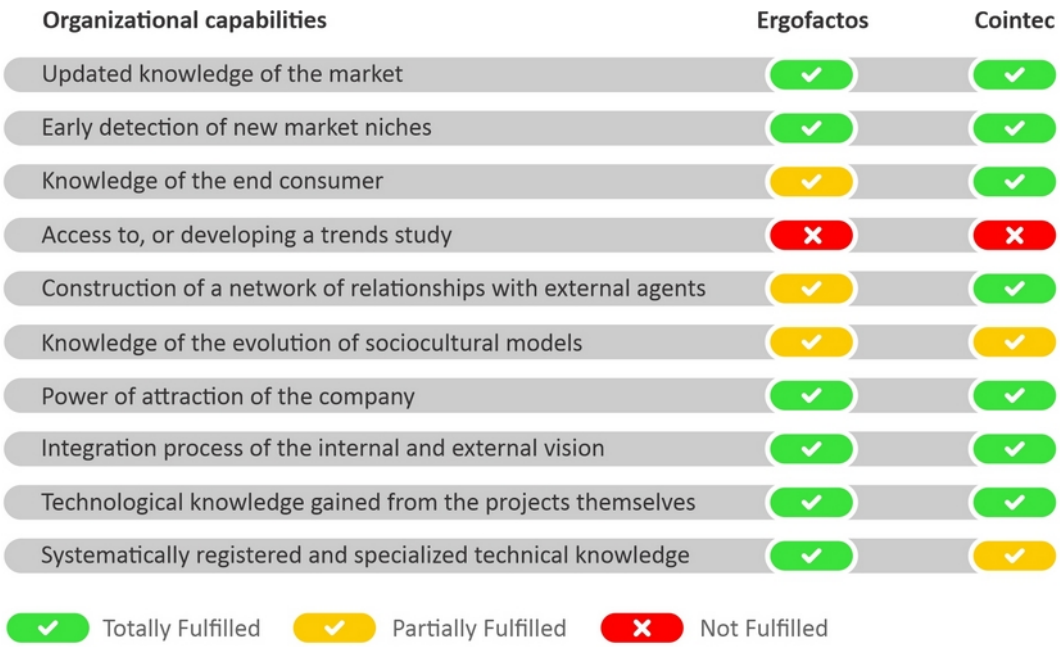

Figure 6. Organizational capabilities applied by the companies. Adapted from Aguilar and Hernández (2012)

Figure 6 summarizes the organizational abilities, pointed out by Aguilar and Hernández (2012), which were completely or partially addressed by each one of the companies

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analyzed, such as those aspects that were not addressed. Both companies applied at least six of the ten abilities completely and, in both cases, only one ability, "access to, or developing a trends study" was not addressed.

In respect to the capability "knowledge of the evolution of the sociocultural models", it is partially fulfilled. In the middle of the pandemic, provisions and guidelines of the State have been evolving to manage the situation, but not only in terms of biosecurity protocol. It is important also observing the changes in the dynamics of society, which have adopted new customs such as social distancing and limited gatherings, among others. The behavior of chatting close, hand shaking, hugs and kisses, and other characteristics of the Latino spirit, have been forced to change abruptly.

3.2. Analysis of experiences from innovation

Taking as a reference the design spectrum proposed by Na, Choi and Harrison (2017), it is possible to identify innovations in the three levels in which design shows up within a company's dynamics. Figure 5 shows the relationship of these manifestations in the three levels.

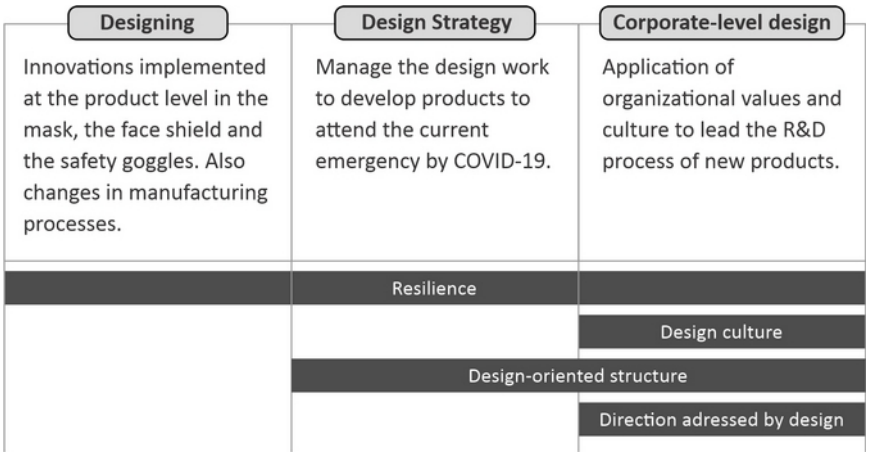

Figure 7. Relationship between Innovations' manifestation and the design spectrum.

3.3. Innovation achieved by resilience

Deserti and Rizzo (2013) propose a way to stimulate innovation processes leading to the enterprises sustainability; according to this theory, organizations may have the ability to anticipate and adjust themselves to different changes that may threaten their purchasing perspectives, before the situation becomes imminently obvious. In this regard, both companies demonstrated resilience by quickly acting and developing new products, in the midst of the economic and social crisis derived from the pandemic. The resilience value becomes clear through the following facts: Ergofactos changed its traditional market niche and sales model and Cointec generated a new line of products, for a new sector in which it had no previous experience.

In this process, the owners of both companies could clearly observe how resilience becomes a real fact, showing itself in everyone's work and attitudes, from collaborators to senior managers. In front of the isolation and quarantines caused by the pandemic, both companies had to make quick and clever decisions to keep running and to respond to the imminent decline of their income from its main economic activity. Having developed products in such a short time and successfully bringing them to the end-user, demonstrate resilience in all areas

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of the organizations, including the R&D team, production operators and the marketing team; all modified their regular activities to adapt in a short time to the new developments of their companies.

3.4. Innovation conveyed by design culture

The second aspect that allowed innovation to show up in both companies is definitely the design culture present in Ergofactos and Cointec. Deserti and Rizzo (2013) define design culture as the set of knowledge, competences and skills that operate in a given context and mediate with production and consumption to develop new products. In line with this approach, the pandemic changed consumption patterns, since it introduced into society a new need related to microbiological protection that was not necessary before. Both companies reinvented themselves to offer products to this new market, and this was possible thanks to the fact that in each organization design is recognized as the core of its work and also to the necessary changes made in the production processes.

Now, the design culture that characterizes these Colombian companies is based on their own values established from the beginning and which are not negotiable, even in times of adversity. Both companies decided to carry out the development of new products under the premise of maintaining jobs, producing according to their capabilities, manufacturing with quality and respecting a good payment of labor, although the market was demanding the opposite.

Masks, face shields and safety goggles, revealed the design culture and values of both organizations, highlighting the following aspects: respect and appreciation to their employees; assessment of the design team; change-oriented work teams; quality in communication processes; design thinking in collaborators; acceptance of risks; decision-making in a timely manner and rational use of resources.

3.5. Innovation through design-oriented structure

Both Ergofactos and Cointec have a business structure that places design thinking at the center of the organization. Both companies have R&D or design areas and an organizational structure that consider these departments as an important factor in the decision-making process. According to Celaschi, Marco, Staszowski, Galisai and Casoni (2009), organizations that have a design-oriented structure can react more quickly and effectively to changes; this was evident in the two cases studied.

Another factor that played a very important role was the fact that both companies were manufacturers, what means that they had the technological and human resources to carry out innovations, unlike companies that only distribute or market manufactured goods and therefore, depend on the producers.

On the other hand, an advantage of the small organizations is that in extreme situations, changing the context, turning toward the design and development of new products can be made easier, the production, as well as the logistics and commercialization that are oriented by design thinking.

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3.6. Innovation conveyed through design-driven direction

A study carried out by Na et al. (2017) on different manufacture companies found that there is a greater tendency towards innovation when those who occupy managerial positions are professionals with knowledge on strategic design, which allows organizations to offer products and services that are adapted to constant markets change. This characteristic is common to both companies, with the difference that in Ergofactos the partners and the manager are both industrial designers, while in Cointec the general manager has worked as an empirical designer during 31 years, time that the company has been in the market, showing that design thinking is not exclusive to professionals in these areas. In any case, a visible head with a design focus boosts innovation processes in all areas of the company.

4. LEARNINGS ORIENTED TOWARDS STRATEGIC DESIGN

Applying strategic design at a macro-level is difficult, because it is outside the direct influence of the actors (Geels, 2005, as cited by de Arruda Torres, 2018). However, the current pandemic generated abrupt changes at this level, forcing sociotechnical systems and niches to adapt, and in this context, strategic design played a decisive role. Next, the main learnings derived from the analysis are summarized with an aim to ease its consideration in future projects.

4.1. Value the design culture in action

Developing a product in times of the pandemic was the occasion to see the design culture in action, acting simultaneously with corporate values. This situation showed up how strategic design thinking should be involved in new forms of distribution, services, social behavior, social innovation and new cultural dynamics. Moraes as cited by Moreira & Bernardes (2014, pp. 111) mentions, "design must deal with the complexity of moving from technique to a technological culture, from production to a productive culture and from the project itself to a project culture". This is essential and should be reinforced under the sociotechnical approach, without getting away corporate values at all. Under this challenging context, owners and managers of both companies were able to identify strategies that let them achieve a comprehensive incorporation of design into the thinking and action of their organizations, including also individuals and communities.

Another lesson is that the design culture must be transmitted two-ways in the organization, from the bottom to the top and from the top to the bottom. The very small organizations are more vulnerable to financial ruin; therefore, the design culture can activate the possibilities to innovate and generate strategies for survival and repositioning.

4.2. Incorporate design thinking at high levels

Ergofactos has designers who accomplish operational, tactical and strategic activities, which enhances design at all levels of the organization. Furthermore, since there are no boundaries between departments, open communication from and about design is encouraged, flowing vertically and horizontally in the organizational structure. Cointec, being a larger company, has a greater separation between departments, but also favor a greater fluidity of design thinking between levels, investing in professional design training for its collaborators. If managers (CEO) don´t have a design thinking focus, there is no way to stimulate the

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capacities to recognize design as a force that drives innovation and creates value to the whole process of designing, producing and selling new products. In fact, design knowledge does not flow into companies simply because they have a department.

4.3. Organizational capabilities and innovation from design in MSMEs

Building a network of privileged relationships with agents outside the company can boost innovation. MSMEs that are grouped together to manufacture and market can compete in specialized markets not covered by large companies. The important thing is to detect how collaboration networks can be created to enhance their production and marketing capacity. Thanks to the association, productive response capabilities and attention to new markets change and let companies to survive in the midst of a crisis. Adding capabilities instead of competing is a tool that motivates innovation.

In the experiences described in this article, resilience was revealed as a key factor that make possible the display of innovation. Considering the studies consulted, it seems that MSMEs, thanks to their resilience, can more quickly adopt models of design thinking, design management, strategic design and design-driven innovation. To face the challenges that are surely coming due to this pandemic, the companies analyzed will have to continue strengthening resilience. As is has been proved here, resilience is a capacity that enhances innovation in times of crisis. In this sense, one can learn from the flexibility of the textile and fashion industry in East Midlans (Oxborrow & Brindley, 2012), where key elements to survive even in times of economic depression are observed.

In respect to the organizational abilities not addressed, it is important to highlight "access to, or developing a trends study", because it was not considered relevant in that moment. However, having done a quick analysis of prospective trends, would have even enhanced the design more, in the case of the masks, for example. If they had recognized that this device would return to a piece of clothing, its design could have considered esthetical topics of fashion, beyond only fulfilling the safety requirements, avoiding the saturation in the market as elements of personal protection. In line with the aforementioned, facing the contingency scenarios it is advisable to perform surveillance technology activities, but in a quick and easy way, with agile procedures. The lesson is that this aspect must not forget, not skip, because it may close opportunities in other markets.

Another learning lesson is that the knowledge of the evolution is that the sociocultural models should be updated more frequently, not to create stereotypes of behaviors, that can directly or indirectly affect the products designed for Covid-19 and that can lead to new social practices, and therefore new forms to see functionality, social use, and the usability that people attribute to them.

4.4. Vision of design within the company

Entrepreneurs often do not identify design as a strategic component that leads to innovation. They see the practice of design as a mere operational exercise (designing) that only adds aesthetic, style, visual enhancement and luxury components. A few of them identify and activate it as a tactical design and the least as a strategic design (Moreira & Bernardes 2014; Volkova & Jakobsone, 2013). The paradox is that there is a need for differentiation in the market, but usually design is not recognized as a strategic key to make that differentiation more easily possible. When the value of strategic design is well recognized, it takes the

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companies to place the designer as the main leader of the innovation process (Alarcón & Ferruzca, 2020). They must empower themselves with strategic design seen as a key element of the managerial process that other professionals sometimes assume. Any company must give space for designers to grow and make career in management and occupy positions involving decision-making mainly regarding the development of new products or the improvement of old ones.

4.5. Vision of design from a political point of view

In Colombian companies, design is usually associated with productivity and not with competitiveness (Franky, Bohórquez & Romero, 2011). Design insertion studies show that the design is provided by the client in about 25% and the copies or adapted copies are around 26%. On the other hand, CEOs, generally do not offer training in design; they just control final design decisions, in more than half of cases (Franky et al., 2011). An effort has been made to implement the strategic value of design in this country. One result is the web information system called Checking Design that allows companies to meet and understand the competitiveness states by sector (Paredes-López; Manrique-López & Carrillo-Bernal, 2016), but MSMEs must use and apply it more often. A state policy of innovation and strategic management aimed at creating a design culture at business level is needed.

5. CONCLUSIONS

Medium and small businesses, for their flexibility at role and organizational levels, can reorient their organizational abilities from the design toward the innovation easily before contingency plans. That characteristic is enhanced by the positioning of directive or managerial positions on the part of product designers and developers, who boost innovation easier. It would be interesting to investigate if the organizational abilities of the design, observed in those medium and small companies, are characteristics of the Colombian manufacturing culture. Therefore, the PstC model is a useful tool to organize the experiences and carry out the respective analysis.

The innovation capabilities are associated with the decision of the directives of the company to act assertive facing the contingency, generating new products, including new markets. It does not matter the size of the organization, but the willingness to innovate as a resilience driver in critical and unforeseeable situations. In this sense, it would be important to go in-depth into the factors that enhance the willingness to innovate and that mobilize the decision-making of the directives to keep the business operating according to the company values. This analysis helps to point out the aspects that contribute to the sustainability and to the growth of the business, from design and innovation.

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