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Design(ing) Manufacturing Collaboration

THE CASE OF THE FURNITURE SECTOR IN URUGUAY

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COLLABORATION BETWEEN DESIGN AND MANUFACTURING

Preface

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The word *collaboration* is mentioned more than 100 times in the following contribution, so it seems only appropriate to understand what motivated this focus.

The authors are involved in industrial design activities; they value design as a strategic problem-solving process that aims to improve people's quality of life, and consequently build business success through innovation.

Design is a social activity. It brings together diverse disciplines to expand and co-construct new knowledge and skills, leading to desirable new products, services and systems. In this process, designers make use of creativity to propose innovative alternatives. In other words, as Herbert Simon (1969) explained «*Design is the process of changing existing conditions into preferred ones*.»

The authors draw attention to the industrial context of their study in Uruguay, stressing the cultural background and socio-economic challenges of this Latin American country while confronted with modernist views of contemporary design vision. In this context, it became clear to them that «*[T]he culture of modernity and progression, to-*

gether with that of industrialisation and design spread from the Global North to the Global South, generating a form of cultural colonisation that is today under the lenses of reconsideration.» This realization led the authors to bring attention to the value of collaboration between local designers and producers of the country's furniture sector rather than solely focusing on informing the design process for better business performance; thus, arguing in favor of true and efficient design collaboration and the benefits it could generate for the industry.

By analyzing the dynamics between Uruguay's design studios and furniture manufacturers, the authors examine the obstacles which arise in the process of collaboration between designers and other experts. They aim to bridge the gap between design and industry. They propose a tool to facilitate a collaborative culture. With the tool, all parties engage in early discussion, allowing them to elaborate a common understanding of the project scope. Such up-front discussions help all participants to align their mental models, share knowledge and collectively establish a collaborative framework.

The authors draw particular attention to the importance of communication. Indeed, actors from different disciplines use often discipline-specific language; use different methods to represent the design; and tend to operate on different levels of abstraction.

The study highlights how collaboration experience, trust and professional respect can affect the success of a design project. The focus on collaborative design highlights the importance of developing a common language and shared understanding among people working together to create new artifacts. Tensions and conflicting ideas are always part of work dynamics and negotiating, better understanding each other and reaching a consensus on goals allows a project to move forward.

As presented in the case study, collaborative design is an activity that enriches the group's knowledge, helps members of the group understand various viewpoints, and contributes to the construction of a common understanding for a common goal. However, without a profound understanding of these parameters, *collaborative design* can easily become a buzzword.

There are various definitions of *collaboration*. Merriam-Webster dictionary describes it as: «*to work jointly with others or together*

especially in an intellectual endeavor.» Others explain the concept of collaboration in terms of success: «*[…] collaborative success can therefore be said to be achieved when we have accomplished something in a group which could not be accomplished by an individual*» Kvan (2000). He insists on the creative aspect of working together and understanding the interdependencies of the actors to find solutions that are satisfactory to all. Rosen (2007) also outlines the importance of the conditions for a collaborative culture while «*working together to create value*» by «*sharing virtual or physical space.*» Authentic collaborative partnership, according to him, must have certain characteristics that he identified as the «*ten cultural elements of collaboration*»: trust, sharing, goals, innovation, environment, collaborative chaos, constructive confrontation, communication, community and value.

According to Kleinsmann and van der Lugt (2007) «*During collaborative design, actors have to create shared understanding about the design they are making as well as the design process they have to fulfill.*» They add that in a design team, the creation of shared understanding is difficult because actors have different mental models of the design. According to Valkenburg (1998) shared understanding is defined as «*a mutual view amongst the team members on relevant design topics and design activities.*»

Studies of other disciplines also show that practitioners encounter difficulties when sharing knowledge and transforming their knowledge into a format that is understandable and useful for others.

This book is a significant contribution to understanding the challenges in collaboration dynamics when expectations differ. The study emphasizes the importance of taking into account the cultural specificities of a contextual environment in which a project evolves. As mentioned in the book, actors learned to overcome barriers… «*[D]esign studios and manufacturing companies became partners throughout the process, working together to achieve common objectives.*» The barriers to collaboration observed among actors are, however, like what can be observed in some other multidisciplinary fields. The tool developed in the context of the study for overcoming collaboration difficulties is an important addition to design education and practice.

Introduction

Latin America industrialization had predominantly involved replicating products designed in the central countries (Cabrera, 2016). The specificities of this process have resulted in a disconnection between the scientific sector, influenced by theoretical concepts from central regions, and the local industry reality (Cabrera, 2016). Uruguay is no exception to this phenomenon, and a remarkable disconnection exists between the academic system and the productive sector. Consequently, there is a common belief that Uruguay's lack of a robust industry posed a significant obstacle to the development of industrial design. A recent survey on innovation in Uruguayan companies revealed that a mere 19% engage in innovative activities, and only 6% are linked with knowledge-producing institutions like universities or research centers (Hernandez *et al*., 2021).

Worker participation in design practices to increase the value of industrial production dates back to Participatory Design in the Nordic countries during the 1970s (Sanders and Stappers, 2008). Collaborative work brings diverse perspectives and responsibilities to the project, necessitating interdependence to achieve common objec-

tives (Kleinsmann, 2006). Thus, encouraging collaboration between designers and manufacturing companies in Uruguay offers a potential way to bridge the existing gap between these sectors.

The characteristics of the Uruguayan furniture industry – small-scale production, semi-artisanal process, and customizable products – necessitate a close relationship between producers and designers. Strengthened collaboration is therefore critical to the success of new product development.

However, the disconnect between designers and manufacturing companies remains a challenge. This research aimed to explore the state of the design in Uruguay, specifically in relation to the productive sector. It analyzed how collaboration between design studios and manufacturing companies, particularly in the furniture industry, is carried out, and sought to understand the challenges within this collaboration. The primary goal was to define strategies to strengthen the collaboration between design studios and furniture manufacturers in Uruguay during New Product Development (NPD).

This book was structured into four main sections. The first section focuses on positioning design within a broader context of interaction. The second section delves deeper into understanding the design landscape and its relationship with the manufacturing sector in Uruguay, while also contextualizing the collaboration between the two. The third section is dedicated to the development of a tool aimed at strengthening this collaboration. Finally, the fourth section explores the potential for this tool to be adapted and implemented beyond its original context.

The first section aims to position design through a critical reflection on design theories and their practical application in various cultural environments. It includes a broad overview of the expected impact of design in countries with different levels of industrialization. Additionally, collaboration is introduced as the driving force behind product design and development, engaging diverse participants to enhance the potential of collaborative approaches for new product development. This section also explores the historical development of industrial design in Latin America and its connection to local industry, highlighting the challenges of adopting practices from central countries. Key factors, such as the unique path of industrial progress in the region, the gap

between theoretical concepts and local industry realities, and the significance of cultural traditions, are examined. The final chapter of this section presents a broader perspective on what it means to be a designer in Uruguay, featuring critical insights from various local industrial designers. It aims to provide an understanding of the diverse approaches to design and its relationship with the local industry.

The second section deepens the understanding of design in Uruguay and its connection to the manufacturing industry. The initial phase involved gaining a comprehensive view of the product design field in Uruguay, offering insights into the design process and its relationship with manufacturing companies. Notably, it became evident that furniture design was the most influential domain, with design studios creating projects for each client and collaborating closely with manufacturing companies. The next phase delves into the working dynamics between design studios and manufacturing companies. Interviews with both groups revealed key aspects of furniture production, such as project customization, small-scale production or unique pieces, and flexibility in the production techniques. Moreover, challenges in the collaboration were observed, primarily associated with the lack of experience working together and unfamiliarity with each other's work. This highlighted the need for stronger collaborative environments to achieve common goals in product development. Additionally, the section explores the theoretical aspects of collaborative dynamics in design, based on observations of characteristics unique to design in Uruguay. The central focus is on understanding the essential role of collaboration between designers and manufacturing companies in the product development. A selection of tools aimed at enhancing collaboration was analyzed, guided by the goal of developing a solution to strengthen these partnerships. This section concludes by synthetizing prior research findings on local collaboration between designers and furniture producers, aligned with the theoretical framework of collaborative design. The aim is to gain a comprehensive perspective on the accumulated information gathered and to define strategies for improving the collaboration between design studios and manufacturing companies.

The third section focuses on addressing the challenges identified in collaboration between design and local industry. Initially, it

establishes the requirements that will guide the process, translating the insights from the earlier phases into concrete features for the development of a tool to strengthen the collaboration. A tool, EnCo, was developed to strengthen collaboration during the productive visit, where design studios and furniture producers define the details of the project. The tool's primary function is to structure the meeting, facilitate the decision-making process, and encourage knowledge integration between the actors. It aims to promote genuine collaboration and respect for everyone's work. After developing EnCo, the tool was validated through interviews with the involved stakeholders, gathering feedback and assessing its effectiveness in the collaboration process. The performance of the tool was discussed alongside research findings. This chapter concludes the book by connecting the general overview of design in Uruguay and its regional influences to a specific intervention with the design of EnCo.

The fourth and final section focuses on analyzing the future possibilities and scalability of EnCo. It examines the universal and contextual components that make it possible to evaluate the tool's adaptability, as well as its implementation in other productive sectors and geographic contexts.

PART 1

Reasoning on the Context of Design Intervention

1. Designing into and out of Context: a Critical Reflection

At the 29th General Assembly of the ICSID (International Council of Societies of Industrial Design) the association changed its name to World Design Organisation and updated the definition of Industrial Design as follows:

> **Industrial Design is a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences. Industrial Design bridges the gap between what is and what's possible. It is a trans-disciplinary profession that harnesses creativity to resolve problems and co-create solutions with the intent of making a product, system, service, experience or a business, better. At its heart, Industrial Design provides a more optimistic way of looking at the future by reframing problems as opportunities. It links innovation, technology, research, business, and customers to provide new value and competitive advantage across economic, social, and environmental spheres. (https://wdo.org/about/definition/, 2015)**

This definition highlighted the general understanding the design has a strategic role in promoting innovation and improving many aspects of the world we live in, so that it can have a positive impact on people's life and on society at a larger scale. This optimistic perspective is widely accepted and thus design is sought as a solution to many issues, that are not just about how to successfully create, make and sell things (from tangible objects to intangible experiences) but rather about how to transform the environment and the social and economic constructs to develop a better future. In this perspective design corroborates the idea of modern industrial societies being the model to aspire for the development of all countries.

It is interesting to notice that while in the academic and public discussion the design practice and discipline has lost the attribution of *Industrial* – possibly because the global north is in a post-industrial era, it is still intrinsically linked to the transformation that the industrialisation enabled in developed countries. Indeed, countries that are not fully industrialized look at (industrial) design as a source of knowledge to develop their economy and society. This phenomenon derived from the assumption that the design practice and theory developed in Europe and USA should work as well anywhere else and it generated an acritical transfer of such knowledge and praxis to the rest of the world.

Therefore, it happened that the culture of modernity and progression, together with that of industrialisation and design spread from the Global North to the Global South, generating a form of cultural colonisation that is today under the lenses of reconsideration.

> **[…] countries like the ones in Latin America arrived late to the industrial development and find themselves at a crossroad, as design, not infrequently, is understood as a sign of modernity and progress, but this idea involves the adoption of concepts which have been generated in the central countries, and this may not be consistent with either the state of development of the industry or with other issues.(Morales, 2015)**

Today awareness is raising on both sides of the acritical transfer phenomenon making design scholars posing new questions about how to develop design in non-industrialized countries and respective local communities and cultures.

It is the framework of these reconsiderations of consolidated assumptions that the research presented in this book evolved. Indeed, the three authors represent a bridge between the two worlds. Sosa is a Uruguayan designer who attended a Master of Science in Design & Engineering at Politecnico di Milano, while Ferraris and Dastoli are the Italian researchers grown up professionally in the Design Department of Politecnico di Milano and guiding her study. In a way Sosa represents the archetype of all pupils who reach a *modernized* country to gain the knowledge it can offer, and the teachers represent the *source of wisdom* to share. Soon after discussing the topic of the study, the three authors gain awareness of the implicit colonizing approach we would have if we did not pay attention to it.

At the beginning we thought that being designers empathic and naturally drawn to listen to the receivers of their action, there would be respect for the local culture. Indeed, as the interviews were done by a Uruguayan to her own country stakeholders, we thought we were ok. However, after collecting the data we were supposed to give insights and suggestions on how to improve the design process in the local companies and we started to question what we were doing. Our *suggestions for improvement* implied an attempt to boost industrialization, modernization and technological progress. At that point we started to wonder if that was the right thing to do and if we were the right people to make that decision. Finally, we decided that instead of sharing information, for instance of how to boost design innovations or how to apply new manufacturing processes, we would share our competence in implementing collaborative skills.

Collaboration as an integral part of the theories and practices of design, represents a transversal approach that can potentially be experimented with and implemented in diverse contexts of intervention. Indeed, collaboration perspectives and interventions can be adapted to the scope and characteristics of the context, by enabling a bottom-up flourishing of data and results. Therefore, within this volume, collaboration has been considered as the driving approach

to avoid the application of Western, top-down perspectives of design intervention and deepen the discussion about the emphasis that collaboration has having in current economic and social discourse for growth and prosperity.

2. Collaboration as an Approach for Social and Economic Prosperity

This chapter introduces collaboration as the driving force for product design and development through the engagement of diverse participants. Therefore, collaboration is here introduced not to remark its success in western contexts of design interventions, but as neutral enabler for the growth and prosperity of societies when applied for product design and development. This is made possible due to the economic perspective that the authors are relying on when assuming that collaboration for product design could facilitate dynamics of product design in the Uruguayan context.

By relying on an economic perspective of collaboration for designing and developing products, it is widely acknowledged that a collaborative approach that engages diverse types of know-hows often leads to economic growth and prosperity of the community. Although the economic discourse related to collaboration is not the focus of this volume, we report one relevant perspective that among the others inspires the recent direction of design theories development with collaboration between diverse stakeholders as the driver concept.

Hausmann *et al*. (2014) describe products as manifestations of

the productive knowledge they embed. Productive knowledge can be understood as the combination of complementary and diverse knowledge resulting in specialized production expertise embedded at the level of the individuals or grouped in organizations and into networks of organizations (Stam & Spigel, 2017). When a large amount of diverse knowledge becomes productive through complementary combinations, individuals, companies, and networks specialize. Hausmann *et al*. (2014) claim that specialization has allowed modern society to access a quantity of knowledge that it would not have been possible to hold individually. Hence, by reinterpreting Adam Smith's idea that the division of labor directly leads to wealth creation (Smith, 1776), the authors emphasize that the division of labor in terms of collective usage of high amounts of knowledge represents the modern formula for the evolution of society and economic prosperity (see also Hidalgo & Hausmann, 2009).

This economic perspective of combining diverse knowledge for prosperity is driving the knowledge economy, or the current paradigm for the advancement of countries. The knowledge economy describes collaboration between diverse know-hows critical since it is strictly related with the contemporary technological revolution. If over the last century, the development and prosperity of a country mostly depended on linear dynamics of interaction between production and consumption systems, i.e., mass production and consumption, the 21st century opened a panorama where production and consumption standards are continuously disrupted (Whitney, 2015). When technologies advance fast, the dynamics of consumption may embrace major changes faster than the reaction of the production system (Porter & Kramer, 2011; Whitney, 2015). Consequently, realities in the production system might find it challenging to innovate and compete when standards are constantly being disrupted. And when technologies and consequent innovation advance fast and production realities often find it challenging to satisfy market demand by relying only on their specific knowledge base.

Within countries where manufacturing industry plays a vital role for the growth and prosperity of the society, collaboration between actors of the social context has often made the economic success of the territory.

With a specific reference to product design and development, Italy represents one of the most interesting case studies due to the strong collaboration between local entrepreneurs and the manufacturing system. During the 19th and early 20th centuries, in Italy, a significant part of industrial dynamics for product development relied on agglomerations of small and medium-sized firms specialized in different production and distribution sectors to develop innovative products, namely industrial districts (Belussi & Sedita, 2019). The industrial districts' literature widely acknowledges the social dimension of local production systems as the primary enabler of productive interactions for new product development (e.g., see Becattini, 2002; Morosini, 2004). Camuffo and Grandinetti (2011) describe social relationships as the primary promoter of higher efficiency as informal participation and cooperation allow for cost-saving in new product development. Therefore, knowledge spillovers, co-located creativity, and the collective development of innovations allowed companies to improve their competitive performance toward the efficiency of the industry they belonged to.

With the strengthening of the social structure within the local production systems, industrial design found a favorable context to develop and represent the primary resource for economic growth. Running throughout the 20th century, the development and assessment of Italian Design as an economic asset started from the foundation of the Triennale di Milano as the first national and international reference institution for Design, the great masters Zanuso, Castiglioni, Magistretti, Albini, and Scarpa in the 50s, and the born of a solid connection between Design and Industry in the 60s, with the establishment of a national and international grand prize for design and the founding of the ADI, Association for Industrial Design in the 60s, the launch of the Salone del Mobile in Milan, born on the initiative of enlightened entrepreneurs.

Today, the Italian design system has become a tile of globalized design thanks to a competitive advantage linked to a training system spread throughout the territory and companies capable of attracting the best national and international designers. Italy imports talent in exchange for technology, efficiency, and great manufacturing experience capable of materializing ideas and projects. Such development

is undoubtedly the child of a fertile and articulate cultural environment, nurtured daily by the work of numerous quality manufacturing and service enterprises linked to the territory, authoritative trade journals, highly active trade associations, and prestigious museum institutions. From the nationwide spread of skills and training, the close alliance with all sectors of the manufacturing world to the undisputed ability to convey innovation, sustainability, and beauty. Undoubtedly, design represents the intangible infrastructure of Made in Italy.

If the context of collaboration in Italy led to the social and economic success of the country, it anticipated the current trend of the economic society to combine knowledge to advance. Particularly, collaboration dynamics within the Italian production system made evident the need for product design to exchange and integrate diverse and dispersed know-how for design success. In collaborative contexts of product design and development, design participates through «*a process of interactive construction that tries to reach the precise scope of shaping a new artifact*» (Maffei & Zurlo, 2000).

Following the Italian model of development, which was based on small and medium-size firms, Uruguay attempted to adopt a similar system in the 1980s with support from the Italian government. This collaboration aimed to create a specialized center to teach design and improve the competitiveness of local small businesses. However, the development of industrial design in Uruguay presents unique characteristics that require a broader understanding of the specific challenges involved in the development of the industrial design, both within the country and the wider region.

With this premise, the authors open an investigation on collaboration dynamics and results between design studios in Uruguay and the local producers. The next chapter starts describing in detail the context of intervention of this investigation and its evolution from the perspective of industrial design in the Latin America region.

3. Introducing Design in Latin America for the Productive Sector

The development of Industrial Design in Latin America is a complicated process marked by various stages, intricately related with the social, political, and the economic context of the region, that had an impact on the industrial design and its relationship with the industry.

Latin America, comprising South America, Central America, Mexico, and the Caribbean Islands, is a diverse region with a multifaceted history, with both shared pasts and unique differences among its counties. Over the time, industrial design has been shaped by social, political, and economics factors, leading to distinct phases of development and transformation.

The transformation of Latin America during the 20th century was radical. The population grew from 70 million inhabitants to 500 million by the end of the century. Whereas three out of four people lived in rural zones, this shifted to two out of three living in urban centers by its end. Additionally, the economy became five times larger than in 1900. However, Latin America still did not have much space in the developed world (Thorp, 1998).

Compared to Africa or Asia, Latin America was integrated early into the mercantilist expansion led by Europe. This early integration was evident at the beginning of the century when some parts of Latin America were better connected to European and United State ports than to areas within their own countries. However, early integration into the global economy did not equate to economic autonomy. Like during the colonization period, the economy at the beginning of the century was still based on natural resources (Ocampo, 2004).

With the growth of the internal market and the development of a diverse and modern economy in the interwar period, industrialization driven by the internal market became the main source of growth, with the state playing a fundamental role. Nevertheless, the exportation of natural resources continued. External financing helped to support this growth until 1973, but the boom-and-bust cycles of external flows led to the worst economic crisis during the 1980s. In the 1990s, economic liberation driven by external financing negatively impacted production, resulting in slow growth rates (Ocampo, 2004).

Throughout the last century, Latin America had been aligned with global growth, experiencing two phases of expansions: during the early part of the century and after the Second World War. However, the evolution perpetuated the colonial legacy of land concentration and the subjugation of indigenous peoples. Inequality and income concentration worsened, with two out of five families living in poverty by the end of the century (Thorp, 1998).

In conclusion, the development of Industrial Design in Latin America is a reflection of the region's social, political, and economic transformations. Despite early integration into the global economy, the region struggled to achieve economic autonomy, often remaining reliant on natural resource exports. While internal market-driven industrialization efforts were significant, they were insufficient to overcome the deep-seated inequalities and challenges inherited from the colonial period.

3.1 From Commodities to Industrialization

Prior to the development of Industrial Design in Latin America, at the beginning of the 20th century, the production of new manufactured products in the region was limited. Latin America primarily produced commodities from agriculture and mining, while industrial goods (such as machinery) were imported. Moreover, industrial production relied on the acquiring of patents and licenses from developed countries, which restricted innovation to the needs and limitations of the industry (Cabrera, 2016). This approach for industrialization created an asymmetrical relationship, not only related with the low cost of the raw materials and the overpricing of the industrial exports from the developed countries, but also in the development of the new technology and knowledge (Cabrera, 2016).

In 1948, the United Nations Economic Commission for Latin America and the Caribbean (CEPAL) was created with the aim to contribute to the development of the region. It was believed that development was the only way to transform Latin America's role as a producer of raw materials, and industrialization was the key to achieving it (Cabrera, 2016). That meant diversifying sectors and productive areas, as well as state intervention with policies to stimulate the internal market, education and technological progress (Cabrera, 2016). Industrialization was seen as an opportunity for technological development, and a way to decrease the inequality and dependence in the relationship with the central economies (Bonsiepe *et al*., 1985).

During the end of the 1950s and 1960s, Industrial Design was incorporated into the reflexion as a decisive factor to contribute to technological and social development (Bonsiepe *et al*., 1985; Buitrago & Braga, 2014). The development of the productive sector was seen as a relevant factor to create the material culture of the society, and as a consequence, to reduce the technological dependence (Bonsiepe *et al*., 1985). Therefore, the benefits of the industrial design were on micro- and macro-economic aspects (Bonsiepe *et al*., 1985).

The contributions of designers in Latin America such as Gui Bonsiepe in Chile, Tomas Maldonado in Argentina and Carla Porset in Mexico, had a significant impact on the development of the discipline. Design was closely related to the process of industrialization that

was taking place throughout the region. Additionally, the Ulm School of Design (ULM) had a profound influence on design theory in Latin America, as both Tomas Maldonado and Gui Bonsiepe were part of the school (Fernandez, 2006). Therefore, the design principles were focused on mass production and an international language (Sol, 2013). For instance, after Gui Bonsiepe arrival in Chile, he oriented the design practice towards operational rationalism and social projects, closely linked to his previous experience in Germany (Cabrera, 2016).

3.2 Distance between Scientific System and Productive Sector

One of the main structural differences in peripheral design is the distance between the scientific and technological system and the productive sector. According to Cabrera (2016), the original context, which lacked technological resources, is a consequence of the technical and cultural dependence on the center. Latin America was merely reproducing products designed in the developed countries. Moreover, the scientific and academic system approach was following imported theoretical assumptions and pursuing the development model of the center. As a result, there was a dislocation between practices and reality. Furthermore, the technological gap was visible even in cases of innovation, as it was not applied or disseminated, remaining isolated from the social substratum. The result was a disconnection between both parts (Cabrera, 2016).

3.3 Design vs Crafts

During the 1930s and 1940s, the region sought to establish its cultural identity through the development of new products and furniture, using local materials and traditional processes (Chimento, 2023). A notable example is the Butterfly chair, also known as BKF after its designers: Antonio Bonet, Juan Kurchan and Jorge Ferrari Hardoy. This chair, made of iron and cow leather, evokes the traditional way of cooking in the Argentinean countryside and relates rural traditions in

the countryside to the modern architectural space (Chimento, 2023).

However, the development of Design during the industrialization was mostly associated with industrial production, as it was believed to be the sole means to overcoming dependence (Cabrera, 2016). Consequently, Design was defined as a distinct practice from crafts and decorative arts, apparently silencing the local craft tradition in the face of massive production (Devalle, 2021).

Argentina serves as an example of the process of industrialization during the period post-war until the end of 1950s, marked by the development of state-owning manufacturing companies, mainly military-related, which deepened industrialization. From the 1940s, there were some experiences in furniture and lamps design and production. But it was during the 1950s that the concept of industrial design began to take root in Argentinean culture. In the 1960s, the diffusion of the Design reached its peak in Argentina. SIAM, a company that produced cars and home appliances, established a design department and hired professionals to give an identity to the company in the graphics and unified products design (Gay & Samar, 2007).

A notable figure in Design during this period was Porset, a Cuban-born furniture and interior designer who primarily worked in Mexico. She was concerned about finding a balance between the traditional and popular Mexican furniture style and the simplicity of the international style (Sol, 2013). She pondered whether it was possible to be a contemporary designer while embracing a Mexican identity (Sol, 2013). The chair Butaque exemplifies her thoughts about combining international design influences with Mexican traditions.

3.4 The Failure of the Industrialisation

The industrialization process in Latin America did not develop as expected; economic and political changes led to the failure of positioning the region as an industrialized continent. The aim of achieving technological independence from the developed countries, with Design playing an important role, did not materialize.

The failure of the industrialization process in Latin America can be attributed to several causes, mainly related with the degradation of

the local industries, the arrival of international companies, the shift towards dictatorships in the 1970s, and the disconnection between the productive sector and scientific system.

The import substitution policy model of industrialization helped to accelerate the process, expanding the internal market. However, by the late 1950s, a crisis emerged due to machinery deterioration, the impossibility to import replacement, and the lack of economic means to incorporate advanced processes, as a consequence of a global closure of the economy. This led to an economic-political opening, with the establishment of subsidiaries of international companies focused on internal production. Consequently, the innovation effort was reduced, as the technology came from the central countries (Gay & Salmar, 2007).

Moreover, the development of Design was linked with the concept of social and technological design for developing countries, carrying political implications (Cabrera, 2016). For instance, Bonsiepe was part of INTEC in Chile (1970-1973) contributing to a multidisciplinary program aimed at developing small and medium-size industrial companies during the Allende government (Fernandez, 2006). However, with the beginning of the dictatorship in Chile, the project was canceled, and he had to move to Argentina. During the Cold War period, under right-wing governments and the paranoid persecution of communism, the space for the development of the design was severely reduced (Cabrera, 2016).

Another factor that affected the development of the Design discipline was the disconnection between the scientific and technological system with the productive sector. Although many companies made the effort to generate their own technology, it was limited to minor improvements that did not have a substantial impact on the technological knowledge (Cabrera, 2016). The ideas and intentions that designers were trying to achieve followed the logic of the central model, which resulted in a disconnection from the productive reality (Cabrera, 2016). Therefore, their effort was reduced to isolated examples that do not show the reality of the situation (Cabrera, 2016).

3.5 Neo-liberalism and the Local Tradition

The neo-liberal policies implemented in the 1990s motivated designers to seek ways to distinguish themselves from the large number of imported products flooding the market and to reflect on the region's identity (Chimento, 2023). The main principles of the new Design in Latin America were oriented towards the exploration of new materials, the reminiscence to nature and the local context, and the low scale production associated with craftsmanship (Chimento, 2023).

One notable example of this new design approach was the work of the Campana Brothers with the chair Vermelha in 1998. Inspired by Brazilian weaving traditions, the chair represents chaos and the sensorial exploration, reflecting in the essence of craftsmanship (Chimento, 2023).

Moreover, the studio Disegno Patagonia, located in the southern region of Argentina near Bariloche, creates products inspired by the local fauna, drawing from the geometry patterns of Patagonian plants and animals. These products are integrated with the landscape, representing a fusion of popular products connected with the traditional culture of the region with contemporary design. Moreover, they take advantage of the local expertise of craftsmen, making conscious selections of materials and processes (Chimento, 2023).

3.6 Designing in Territory

Observing design in Latin America at the beginning of this century reveals a significant shift in its understanding. After approximately 40 years of formal design education, new approaches have emerged that advocate for a more localized perspective. These approaches have learned from past experiences and recognize that simply adapting theories from Global North is insufficient. Therefore, it is necessary to develop a pluriversal local theory that addresses specific issues and challenges with autonomy.

The concept of design as a tool for achieving independence for central regions is not new. A significant precursor to the autonomy of design in Latin America is Bonsiepe's framework concerning the

center-periphery dichotomy, starting in the 1960s. Penin argues that Bonsiepe's center-periphery terminology explains the dynamics of prioritization, inequality and dependence among nations, regions, or urban centers (Bonsiepe, 2022). This theory of dependence emphasizes rationalism and social sensibility (Fernandez, 2006), where industrialization was viewed as a chance for technological and cultural development (Bonsiepe, 2022). During this period, the expectation of design was to contribute to overcoming dependency and underdevelopment, with a significant social emphasis (Fernandez and Pujol, 2021).

However, the emergence of globalization and the adoption of neoliberal economic models in the 1990s reshaped the landscape for Latin American designers. Moreover, the dominance of private industry in the market shifted the focus of Design away from broader social concerns (Fernandez, 2006). Consequently, the noble intentions of Design did not materialize as expected, raising questions about whether it was the wrong design model or if the industry failed to respond adequately (Fernandez and Pujol, 2022). As a result, design institutions continue to promote repetitive theories detached from practical application (Fernandez, 2006).

Design education provided in peripheral countries can represent a fundamental driver of change, as it can support the initiation of coherent modes of intervention. However, design education still struggles to collaborate effectively with design practice and local production, As Fernandez (2006) observed, in Latin America, Design in academia remains more entrenched than in industry and public-private sector, reflecting its limited impact. Similarly, Morales (2015) argues that design practice in Latin America often adopts theories originated from central countries, which may not align with the realities and challenges faced by local industry. More recently, Anzari claimed that design practice in Global South has lacked a clear direction as it grapples with recognizing its own structural complexity within the modern world-system (Schultz *et al*., 2021).

Decolonizing Design implies a change in how Design is understood (Schultz *et al*., 2018), fostering local economic health and sustainability (Noel *et al*., 2023). Particularly, design education – where Design is taught and practiced – reflects this colonial framework, with skills, methods and research imperatives influenced by dominant Western

universities, authors, curriculum, and disciplinary divisions (Schultz *et al*., 2018). In particular, decolonizing Design involves understanding, contextualizing, and proposing relevant alternatives with a pluriversal vision of Design and strengthening the collaboration of design practice with other stakeholders.

This evolving approach to Design in peripheral countries, particularly in Latin America, results from experimentation and a process of evolution influenced not only by the design theory but also by the region's economic, political, and social contexts. Therefore, understanding the evolution of (Industrial) Design and its relationship with the productive sector in the region is fundamental to better comprehend the current vision of the design and decide how to collaborate effectively.

However, the connection between Design and industry is less of a priority, with other productive systems increasingly being seen as more suitable for local reality. Moreover, Design is becoming less related to the production of physical objects. As Escobar (2018) observed, designers today are called to engage with critical issues such as democracy, activism, the expansion of design spaces, and collaborative design, generating a pluriversal and diverse perspective on design and collaboration. According to Escobar, these dynamics of collaboration, which aim to create autonomy and contextualize design practice, challenge the vision of globalization that reduces local autonomy (Salgado, 2022).

The current trend of Design in Latin America reflects a mature understanding of the region's global position and its broader socio-economic and political context. This approach to Design aims to create a pluriversal vision that addresses local challenges in order to build a more equitable and responsible future for the region.

3.7 Concluding Remarks

The development of Industrial Design in Latin America has been a process characterized by both progress and setbacks. A significant recurring theme throughout the different periods has been the quest

for a distinctive local identity. While Design in the region has been approached diversely, the examples observed often aimed to embrace local traditions, ranging from mass production to low scale craftsmanship manufacturing.

However, in contrast to central countries, Design in Latin America faced different challenges during the development. The productive sector's dependence on knowledge from developed countries impeded the design's ability to effectively bridge this gap. Additionally, frequent economic and political changes disrupted the continuity of policies oriented toward Design development. As a consequence, a disconnect arose between the scientific sector and the industry, with academia primarily focused on adapting theoretical concepts from central countries to a productive sector operating under distinct circumstances (Cabrera, 2016).

The evolution of Design in Latin America is closely tied to the region's context and global geopolitical strategies. However, there is a growing emphasis on developing a local autonomy that better addresses the needs and realities of the region.

4. Framing Design in Uruguay: a Pluriversal Approach

4.1 Positioning Design

The globalized vision of the world, with a single predominant structural narrative, struggles to represent alternative perspectives that could offer different stories and open up new possibilities for collective futures (Richards, 2014). Non-West cultures – variously known as the third World, the undeveloped World, the developing World, and now the Global South – have often been perceived as places of antiquarian traditions and exotic ways, contrasting with Western universal knowledge (Comaroff and Comaroff, 2012). Understanding the realities in the Global South has often relied on importing theories from the Global North rather than creating their own theory (Richards, 2014).

The idea of neutralizing the designer, without considering how personal positions influence designing, may appear to simplify processes and methods, but it is an illusion (Torretta, 2023). Thus, it becomes evident that a pluriversal vision is necessary, one that recognizes and respects the diversity among people and cultures within each region (Schultz *et al*., 2021).

Positioning ourselves within structures of power influences our actions and helps us understand how our position influences designing, offering new perspectives on being designer (Torretta, 2023). A pluriversal perspective advocates for a more realistic, though complex, vision of what it means to be a designer (Torretta, 2023). According to Escobar (2018) this trend reveals an openness to critiques and a willingness to transform Design.

This chapter aims to provide a broader perspective of what it means to be a designer in Uruguay. As discussed in the previous chapter, the development of design as a discipline in Latin America has its own particularities, often adapting concepts from the North to the South. Uruguay is not an exception to this phenomenon. While the following sections position Design within a collaboration context between furniture producers and design studios, there are diverse perspectives on being a designer in the local context. Therefore, this chapter presents design in Uruguay throughout the lens of three local industrial designers.

4.2 Overview of the Design Approach

The main goal of this chapter is to understand and highlight different perspectives on what it means to be a designer in Uruguay. To do this, we explored the role of Design in Uruguay, its relationship with the industry, and the connection between the design education and practice.

Understanding the role of Design helps us better grasp the direction and objectives of the discipline, both short and long terms. The relationship between industry and Design has been a long-standing dilemma in the field, particularly in countries like Uruguay, where the industry sector is limited. This relationship is central to the discussion in subsequent sections. It also examined the link between design education and design practice, as education frames the future practice of the discipline. This is especially relevant today in Uruguay, where the design curriculum is undergoing reform.

To delve deeper into these topics, we conducted interviews with three Uruguayan industrial designers: Daniel Bergara, Mauro Cammá, and Carlo Nicola. All three studied at the Centro de Diseño Industrial

(CDI) and have served as professors at this institution, yet their professional paths differ, offering unique perspectives on their approach to design.

- *Daniel Bergara*: Industrial designer, CDI graduate. Professor at the Escuela Universitaria Centro de Diseño (EUCD, formerly CDI) since 2008, primarily in project area. Director of EUCD between 2009 to 2018. Founding partner at the design studio Diseño Básico since 1991.
- *Mauro Cammá*: Industrial designer, CDI graduate. Professor at EUCD since 2014, teaching in the project area, morphology, and visual communication. President of the Cámara de Diseño del Uruguay (CDU) from 2020 to 2021. Founding partner and director of Lateral Diseño since 2012, focusing on visual identity, communication, and furniture.
- *Carlo Nicola*: Industrial designer, CDI graduate. Professor at EUCD and in the *Furniture Specialization Diploma* program at FADU, focusing on project areas. Founding partner and director of Menini-Nicola since 2008, specializing in furniture and interior design.

The interviews were conducted individually using a semi structured format, focusing on each designer's personal experiences. The goal was to gather critical opinions from designers with local influence and diverse experiences in the field. The discussions covered general aspects of the current design landscape as well as specifics related to their area of expertise.

After the interviews, the information was categorized into three areas: the role of Design in Uruguay, the relationship between Design and industry, and the link between design education and practice. This helped organize the data, but the aim was not to compare the designers directly. Instead, it was to provide a broader, critical perspective on what to be a designer in this context.

4.3 The Role of the Designers in Uruguay

According to Bergara, the role of the Design has undergone constant transformation, which can now be viewed with a temporal perspective.

He explains that during the late 1980's and early 1990s, the focus was on competitiveness. The Centro de Diseño Industrial (CDI) was founded with the goal of supporting the small businesses, following the Italian model. However, the economic crisis of 2002 led to a collapse of this model. Many small companies closed, forcing a revaluation of the purpose of design. From 2005 onward, a new economic model emerged emphasizing social equity. In parallel to this shift, design became integrated into the university system, adopting a more critical and reflexive role[1]. Design education shifted its focus towards working with micro-entrepreneurs, moving away from the industrial sector. This evolution helps understand the current state of design in Uruguay.

Bergara highlights that Design should act as an articulator, updating emerging problems in the relationship between humans and their environment. Therefore, Design should adopt a critical perspective that prioritizes thinking and action over mere production.

Cammá adds that Design has multiple roles, and there are many possible spaces and perspectives for being a designer. The most traditional role is contributing to economic efficiency and competitiveness, which is more common in design practice. He argues that while Design is not fully integrated to the productive system, it is where practitioners and limited existing institutions concentrate their efforts. However, EUCD focuses on positioning Design as an actor for social development, aiming to reduce inequality and contribute to underprivileged areas. Additionally, Cammá notes that there is a growing role for Design in the public sector, presenting an opportunity, especially as Uruguay has a large state system.

Nicola believes that the structural problems surrounding Design are more significant than issues within the discipline itself. Designers often lack the power to influence the rules and decisions that shape their work. He argues that designers need to take a more active political role to be part of the decisions-making process, as no one will grant them spaces unless they fight for it. Cammá agrees, emphasizing that designers need to conquer more spaces, which is as much a political as a disciplinary challenge.

Note 1.
The evolution of design in Uruguay is deepening in section II, chapter 2.

4.4 The Dichotomy between Design and Industry

Bergara explained that from the 1950s to the 1970s, there was local production in industries such as the automotive industry and glass manufacturing, among others. However, these industries eventually disappeared, a shift that can be analyzed through various economic theories like the CEPAL's development model, dependency theory, and later, the poststructuralism. The global economy functions by assigning specific roles to different regions: developed countries focus on technology and knowledge, while peripheral countries provide raw materials. If local designers want to change this dynamic, they must engage with geopolitical issues. Bergara argues that designers need to be aware of the global economic and political situation, as these are fundamental to their work.

He further notes that while designers often dream of an industry that employs them, this is unlikely to happen. Design is not a sector that is inherently in demand by business in Uruguay. It is easy to copy existing designs. Companies often find it easier to copy existing designs, and many small and micro-companies lack the resources to employ designers.

Nicola adds that designers working with local industry are primarily involved in furniture design, collaborating with carpentries, iron workshops, and upholstery workshops. There is limited space for plastic production, and while there are some experimental workshops in ceramic, felt or glass, they have little influence. Cammá points out that these workshops, especially in carpentry and ironwork, often do not employ designers because the owners believe they already know the job and prefer to copy existing solutions.

Cammá argues that the business sector does not provide space for Design to ascend in the hierarchy of influence outlined by the Design Council. In the few cases where designers are employed, they are often part of other roles that are more valued within the company. He believes that Uruguay does not have a significant industrial sector and there is not the correct approach. Instead, there are other productive systems better suited to the country's scale, such as artisanal production, digital fabrication or other hybrid systems that do not rely

on mass production. However, he emphasizes the need for a more critical approach to what is being produced and its cultural value.

Cammá contrasts Uruguay's crafts sector with those of other countries in the region, such as Mexico, Colombia, and Brazil, where the cultural tradition of crafts is deeply rooted. In Uruguay, there is a less romantic vision of crafts; local craftsmanship is more about people making things through their trade rather than engaging in artisanal work with a strong individual signature. The craftsmanship here does not have high technical value. Moreover, he argues that the collaboration between Design and crafts could help shift the paradigm of competitiveness, productivity, and profitability, allowing designers to engage in a different kind of relationship that may lead to new ways of producing. In the integration of Design and craft, Design can contribute to the development of a material culture that intersects innovation and tradition. However, public policy support is necessary to fully value this collaboration.

4.5 Design Education and Practice

Cammá notes that there is little data on where design graduates in Uruguay are working. Those already in the market might have an idea, but comprehensive data is lacking. Many designers are working in areas different from what they studied, creating new opportunities of design interaction and expanding the roles within the discipline. Additionally, all three interviewees mentioned that many industrial designers are now working on UX/UI design or graphic design.

He highlights a gap between academia and the professional sector. The public university (EUCD) does not focus on preparing professionals for the market, whereas private universities may have a more traditional, market-oriented approach to Design. In the past decade, the focus at EUCD has shifted from traditional Industrial Design to stronger emphasis on social aspects, leading to a focus on service and systems design. However, it is not completely rooted.

Bergara believes that the role of the public university is not to produce market-ready designers, as companies often overlook people's needs and perpetuate a centralized model. Instead, he argues that

the university should focus on collaborative efforts aimed at achieving a dignified life.

Nicola argues that the market should not dedicate the direction of the education in Design, but he believes that students need tools to interact with the market where they are likely to work. He suggests that more collaboration between design students and producers is necessary to give practitioners the skills and knowledge to engage with the local industry.

Bergara points out that there are different approaches to Design within EUCD. The university has been involved in creating public politics and networks, but these efforts take time to yield results. In contrast, professional designers, particularly those associated within the Cámara de Diseño del Uruguay (CDU), have closer ties to the industrial sector and business chambers.

Cammá concludes that Uruguay lacks a clear strategic goal. In the past, the focus was on logistics, nature, truism, and service, in addition to its long-standing role as an agricultural exporter. However, there is currently no medium- or long-term political strategy. If such a strategy existed, design could enhance those possibilities and provide a clear goal to focus on.

4.6 Final Remarks

This chapter aimed to explore different perspectives on being a designer in Uruguay. By critically examining Design in this context, it can be positioned within a broader framework of interaction and uncover new areas of influence of the discipline. The next sections will focus on Design within the context of collaboration between furniture producers and designers. This exploration provides an overview of the current state of Design in different contexts of interaction, particularly in the relationship between education and practice. Additionally, this chapter presents a more realistic, though complex, vision of Design in Uruguay offering a critical perspective on its current state.

Three interviews were conducted with local industrial designers who share some similarities, such as their educational backgrounds, though they belong to different generations, and have each served as

professors at the EUCD. Despite these commonalities, their professional paths differ, which helped represent the current reality of Design in Uruguay across three main aspects: the role of Design, its interaction with the industry, and the relationship between education and practice.

The role of Design in Uruguay has been in constant transformation, influenced by global shifts in the discipline as well as social and political changes within the country. Various roles of Design have emerged, from the traditional focus on Industrial Design to Design acting as an articulator of social changes. These roles reflect the ongoing evolution of Design and its adaptation to new circumstances and unique characteristics of Uruguay. However, Design still struggles to have a significant influence on political decision-making in the country.

Design's relationship with the industry in Uruguay is complex. Traditional mass production, as seen globally, does not exist locally, and it should not be the primary focus for designers. The limited industrial sector in Uruguay has little demand for designers. There is a small-scale artisanal production, primarily focused on furniture, involving carpentry and iron workshops. This aspect of production will be explored in depth in following sections. Moreover, Uruguay lacks the rich cultural tradition of crafts found in other countries in the region, such as Colombia and Brazil. Instead, local craftsmanship is more about practical making, which could offer designers a different perspective on production, more aligned with the country's specific characteristics and challenges.

There is also a noticeable gap between design education and practice in Uruguay. The professional design sector is difficult to analyze due to the lack of data on design practice. However, traditional roles in industrial design persist, with designers often working within the framework of the CDU. Additionally, many product designers have found opportunities in UX/UI and graphic design, fields with more job prospects. Many designers have had to carve out their own path, creating new spaces of design integration that fall outside traditional areas of the discipline.

In contrast, design education has shifted the focus over the past decade. Moving away from a traditional approach centered on

industrial inclusion, it now emphasizes a social perspective on design. This shift has sparked debate among designers, particularly in light of the ongoing reformulation of the study plan, which considers the role of Design and its interaction with other actors. The interviews reflect these differing viewpoints.

In conclusion, after more than 30 years of formal design education in Uruguay, it is clear that diverse perspectives exist, all contributing to a critical effort to build a local design identity. Although the field may be expected to have greater relevance and clearer direction, design in Uruguay is in a state of constant transformation and growing, striving to critically engage with theories from other regions while accepting the local realities and continuously seeking to define its own identity.

PART 2

Collaboration between Design and Manufacturing

5. Overview of the Research Process

Previous part of the book provided a general perspective on Design, positioning this research within the broader context of design dynamics in Uruguay, particularly focusing on the relationship between designers and industry. Building on this foundational understanding, the current section delves into the collaboration dynamics between design studios and manufacturing companies within Uruguay's furniture industry, aiming to support new product development (NPD). Specifically, this research is guided by the following research question: How can be strengthened the collaboration between design studios and furniture manufacturers in NPD in Uruguay?

To address this, the research establishes the following objectives:

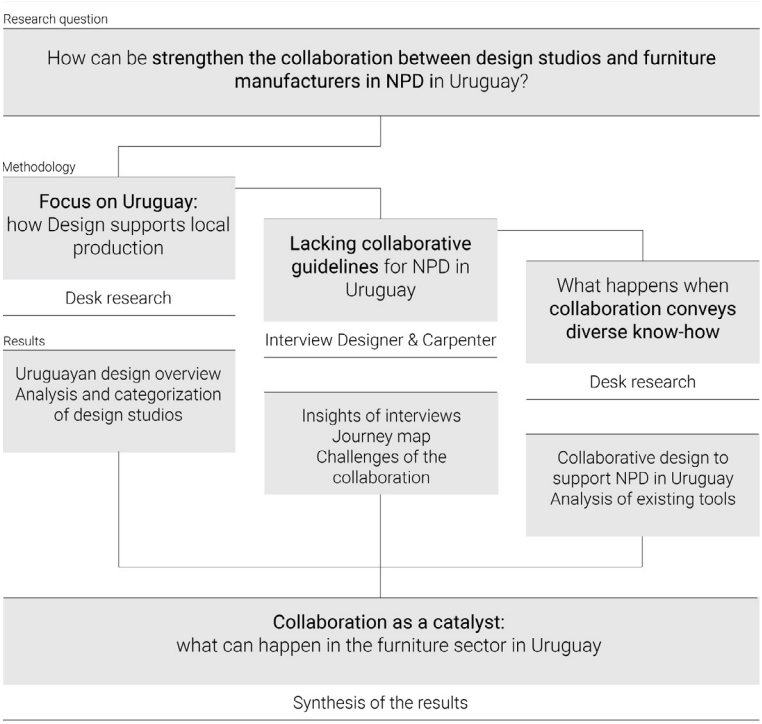
- gain a comprehensive understanding of the current situation of the design intervention within the local productive sector, identifying key domains of influence for industrial designers and understanding the process of NPD;
- define the collaborative dynamics between designers and manufacturing companies, with a particular emphasis on the most relevant industrial sector for design intervention.

The goal of this section is to deepen the understanding of the local design landscape in Uruguay. Despite Uruguay's smaller scale and limited industrial growth, parallels can be drawn with the broader Latin American trends. In recent years, efforts have been made to foster collaboration between the design and the industrial sectors. However, structural challenges – including the early stages of design development, limited national industry growth, and the low levels of cooperation between industrial entities and research institutions – have impeded significant progress in bridging the gap.

This section is divided into four chapters, each offering a broader perspective of collaboration in design in Uruguay:

- the first focuses on better comprehending the local design situation and the main characteristics of NPD;
- the second explores the NPD process in relation to furniture production, identifying the challenges and issues in collaboration;
- the third chapter addresses theoretical concepts of collaboration and examines existing tools to strengthen collaborative dynamics;
- the final chapter synthesizes the previous findings to facilitate the development of a new tool, which will be further elaborated in part three.

Figure 1.
Structure of the research.



5.1 Design in Uruguay to Support Local Production

The first chapter aims to provide a comprehensive overview of the current state of the design field in Uruguay and to begin exploring the relationship between designers and manufacturing companies within the furniture sector. This exploration starts with an overview of Design in Uruguay, which is essential for understanding the present situation, and is further enriched by an analysis of design studios that actively collaborate within the local industry.

The initial step in data collection focused on understanding the current state of the design field in Uruguay and examining the relationship between designers and manufacturing companies. The goal was to identify the primary influences of industrial designers and to gain a comprehensive understanding of the work of design studios within the country.

As part of this phase, an analysis was conducted on design studios that are members of the *Cámara del Diseño de Uruguay* (CDU), an association that brings together designers. The CDU provided a representative sample of how design studios operate, with the most prominent companies actively participating. Members are categorized based on their areas of expertise, including visual communication, textile, product, furniture, interior, landscape, service and interaction UX/UI (CDU, 2024). For this research, the focus was on product design and furniture, as these areas maintain close contact with the fabrication of products. This was further complemented with the information regarding the service or products offered by each studio. Consequently, this approach enabled a deeper understanding of the NPD process in the country and initiated an exploration of the studios' interaction with manufacturing companies.

In the next step, an analysis of the service and products offered by these design studios was made, this provided valuable insights into the operational dynamic of designers in Uruguay.

Based on the collected information, two key actions were taken to better organize and analyze the data: the creation of a map detailing the design studios and their roles in the NPD process, and the categorization of various NPD processes. Building upon the previous mapping exercise, categories of NPD process emerged and were systematically organized. To provide a clearer understanding of the product characteristics within each category, specific examples were included.

The findings from this chapter revealed that one of the most significant domains of product development in Uruguay is furniture design, where design studios and carpentry workshops collaborate closely in the manufacturing process. Consequently, a detailed examination of this relationship between these key actors was undertaken.

5.2 Design and Industry: the Interaction in Furniture Production

This chapter builds on the insights of the previous chapter by exploring the interaction between design studios and furniture production

during the NPD process through a series of interviews. The goal was to uncover the intricacies of the collaborative process and to identify any challenges or barriers encountered.

Interviews were conducted to validate the theoretical data collected and gain a deeper understanding of the interaction between designers and the industrial sector. These interviews included key figures such as Carlo Nicola, representing the design side, Pablo Ferrer from Zona M, and Heber Coitinho from Mundomadera, representing the carpenter side. This approach aimed to capture perspectives from both sides on the collaborative dynamic.

5.2.1 Carlo Nicola from Menini-Nicola

Carlo Nicola is a Uruguayan product designer and co-director of Menini-Nicola, alongside his partner Agustin Menini. Since its establishment in 2008, their design studio has been dedicated to the design of furniture and interior spaces. Menini-Nicola has earned a distinguished reputation in the local market and has garnered international recognition in Brazil and Argentina. Carlo's influence extends beyond his work in the industry, he has actively contributed to the growth of the Design discipline in Uruguay.

Carlo has also been a professor of the *Centro de Diseño Industrial*, teaching in the *Industrial Design* degree program. Additionally, he has been involved in the *Diploma de Especialización en Proyectos de Mobiliario*, a post-graduation program focussing on furniture design at UdelaR. He played a pivotal role as a founding member of the CDU. Over more than 15 years, Carlo has become a reference point in the field of industrial design in Uruguay, actively participating in numerous events and collaborative projects with other designers. These include SUM, an exhibition of furniture, and projects for Design junction in London with the projects *Invisible threads* and *Poetic forms*.

Carlo has also contributed his expertise as a consultant, assisting manufacturing companies in integrating design into their operations and participating in the creation of strategies to connect design with different sectors of the economy. His selection for those interviews was deliberate, grounded in his extensive experience and multifaceted involvement in the design field of Uruguay. His influence extends across education, design associations, and collaboration with

furniture manufacturers, granting him a broad perspective on how the design industry operates within the country.

5.2.2 Pablo Ferrer from Zona M

Carpentry workshops were included in the interviews to provide a comprehensive perspective from both sides of the collaboration. Zona M was selected because of its experience working with Menini-Nicola and its openness to discussions surrounding innovative product production. Zona M employs a traditional technique for furniture production, involving highly skilled workers in their workshops.

5.2.3 Heber Coitinho from Mundomadera

Following the observation that Pablo had extensive experience collaborating with design studios, the decision was made to include an example of a more traditional relationship between designers and carpenters. Heber Coitinho, with over 30 years of experience in the sector, holds a position in the directive of the carpenters' association. Mundomadera shares similarities with Zona M, both operating a well-equipped workshop with specialized workers. However, the primary distinction lies in the client base, as Mundomadera focuses on construction carpentry and has experience collaborating with architects, despite both workshops producing furniture.

An in–deep interview was conducted with Carlo Nicola to gain a comprehensive perspective on Design in Uruguay and explore the relationship between design and manufacturing companies. Additionally, the results of the previous chapter were discussed with Nicola to obtain his expert opinion on the findings.

The questionnaire broadly cover topics related to the general state of the design in the country, the various areas of influence within the field, Nicola's personal experience in the industry, his collaboration experience with manufacturing companies at local and international level through Menini-Nicola, the collective efforts of the designers, and policies aimed at promoting design. Nicola was also asked to narrate the entire process of interaction with carpenters during furniture production, specifically detailing the differences in these interactions when there was prior experience working together. Furthermore, for each phase of the interaction, Nicola was asked to

identify specific incidents and challenges encountered throughout the process.

Subsequent interviews with carpenters involved presenting a diagram derived from the information obtained in the previous interview with Nicola. The carpenters were tasked with narrating their processes, discussing individual steps, and identifying difficulties or issues within the collaboration. Additionally, general information about the carpentry workshop was discussed.

Information gathered from the interviews underwent several forms of analysis, resulting in the following outputs: insights about designers' and carpenters' work, a journey map of the interaction, barriers and enablers for the collaboration, and challenges in the collaboration.

Regarding the insights about design studios' work, the interviews provided a deeper understanding of the local situation and served as a validation of the findings from the previous steps. Through the collaboration of Carlo Nicola, valuable insights were gathered to complement the existing information, while the interviews with the carpenters provided insights into the boarding working sector, deepening the understanding of this productive sector.

A journey map was created to enhance comprehension of the interaction process between both actors. The map delineated the various production stages and highlighted different pathways during the interaction.

Moreover, data from the interviews was consolidated into tables, one representing the designer's perspective and the other the manufacturer's. These tables were organized by production phases, identifying barriers and enablers for the collaboration. These encompassed actions that facilitated or hindered collaboration. Additionally, the tables identified where each actor placed their focus during each step, given their distinct requirements and interests.

After processing of the data, a comprehensive table was constructed to highlight the difficulties encountered by both parties during collaboration. This framework serves to highlight areas where efforts should be concentrated to enhance the collaboration.

5.3 Collaborative Framework

The third chapter delves into the theoretical aspects of collaborative dynamics in Design, with the central focus on understanding the essential role of collaboration between designers and manufacturing companies in product development. This chapter analyzes existing tools designed to enhance collaboration, examining specific aspects of each tool that contribute to improving collaboration. Emphasis is placed on tools that help create shared understanding and facilitate decision-making and negotiation processes within teams.

This section provides a theoretical framework for understanding collaborative design involving diverse actors and evaluating concrete solutions to strengthen collaboration. It serves as a guide for comprehending the structures and processes that enhance collaboration.

5.4 Collaboration in Furniture Production in Uruguay

The primary objective of the four chapters is to offer a comprehensive perspective on the accumulated information and define strategies for strengthening the collaboration between design studios and manufacturing companies. It aims to synthesize the previously collected data and highlight key points essential for strengthening collaboration between both parties. Additionally, this chapter involves analyzing existing tools to gain a broader perspective on fostering shared understanding and facilitating decision-making.

In conclusion, the subsequent chapters of this section present the results of the research conducted in these four phases. Through these phases, we achieved a deeper understanding of the state of Design in Uruguay and gained valuable insights about the collaborative dynamics between manufacturing companies and designers within the country. Furthermore, this research laid the groundwork for developing a tool to improve the collaboration between design studios and furniture manufacturers.

6. Focus on Uruguay: how Design Supports Local Productivity

Uruguay, a small country nestled between the two dominant forces of the continent, Brazil and Argentina, has a population of approximately 3 million. The country's primary economic resources are agriculture, forestry, and animal husbandry.

However, according to Cecilia Ortiz de Taranco, author of the chapter on Uruguay in the book History of the Design in Latin America and the Caribbean by Fernandez and Bonsiepe (2008), design has not found a consolidated presence in the country's production practice. She further explains that the challenges experienced in industrial design are closely tied to the country's small internal market size and the sporadic or partial development of industrial activities. Despite this fragmented trajectory of the design within the nation, there have been some national experiences in the automotive and furniture sector.

6.1 An Overview of Design in Uruguay

The initial phase of Design in Uruguay emerged during the first half of the 20th century, marked by an innovative vision for its time. Pedro Figari played a significant role by implementing an educational reform that promoted an exchange between industry, craftsmanship, and local culture to create practical objects. Moreover, between the 1930s and 1950s, there was a surge in renovating architecture that extended to the interior furnishing of homes. Prominent national architects, including Julio Vilamajó, Mauricio Cravotto, or Román Fresnedo Siri, among others, designed interior spaces and everyday objects. Furniture design adhered to the principles of modern design, emphasizing form, austerity, and the absence of added decoration, but not following the production techniques (Fernandez & Bonsiepe, 2008).

From the mid-1950s to the early 1970s, a new phase unfolded, with the emergence of novel project areas in both industrial and graphic design, alongside initial efforts to establish a specialized design education. In the context of economic policies oriented towards industrialization through import substitution, there were incursions in car design. A prominent instance was Indio car (1970), a low-cost vehicle characterized by its austere aesthetic; only 2000 units were produced (Fernandez & Bonsiepe, 2008).

Regarding the furniture, it was closely integrated within the architecture culture, aligning with the principles of modern design –simplicity, functionality, and industrially based constructive rationality. However, Uruguay followed a distinctive trajectory. On one hand, modern furniture was crafted using traditional techniques, imitating European or North American models, or with local proposals that explored these themes. This duality approach included both craft and Industrial Design, where industrial products were artisanally reproduced. It reflected a conservative perspective by copying international models while concurrently displaying innovation against traditional furniture style. On the other hand, Uruguay hosted licensed operations of renowned design companies such as Knoll and Herman Miller, which left a discernible impact on local production (Fernandez & Bonsiepe, 2008).

Transitioning into the second half of 1980s and throughout the 1990s, a new phase in the country's design development commenced.

This period coincided with the end of the dictatorship, and it was marked by the Design integration into formal education through the establishment of a specialized design center. Emerging designers began to incorporate on the national stage, but with a limited influence. The establishment of design associations also signified the increasing activity within the design landscape (Fernandez & Bonsiepe, 2008).

Product design's role in society has grown in recent years with the emergence of specialized furniture design studios like Menini Nicola, Muar, Samago, and Claro, among others. Additionally, there has been international recognition through participation in design exhibitions and competitions.

6.1.1 The education in Design

Pedro Figari (1861-1938) stands as a pivotal figure in the development of Design in Uruguay. As Rosi explained in the document *Industrial Design for the development of the country* (2018), Figari's effort was dedicated to establishing an institution capable of providing education in both science and art, with the ultimate goal of applying these disciplines to the industrial field. In 1915, he assumed the role of director at the *Escuela Nacional de Artes y Oficios* (National school of arts and crafts). There, he proposed a pedagogical plan that emphasized research and utilization of local raw materials and technologies that enclosed the national culture, all directed towards creating comprehensive and practically valuable objects (Fernandez & Bonsiepe, 2008). The core objective was to train new generations with the competencies needed to deal with the industrialization process. However, the institution as Figari created ceased to exist after his departure (Fernandez & Bonsiepe, 2008).

Following this first effort, experiences emerged in the 1960s at the Faculty of Architecture of *Universidad de la República* (UdelaR) – Uruguay's main public university – and *Universidad del Trabajo del Uruguay* (UTU) – technical school focused on crafts. During this period, an experimental course in furniture design for architecture spaces was conducted between 1963 and 1965. This initiative comprised theoretical courses, practical projects, and was complemented by seminars and exhibitions (Fernandez & Bonsiepe, 2008). Additionally, Tomas Maldonado introduced design seminars in Argentina that were

also presented in Uruguay during this era (Rosi, 2018). These initiatives facilitated the exploration of new educational approaches in Design, although they were truncated after the military coup in 1973 (Rosi, 2018).

With the restoration of democracy in 1985, the government, through the Minister of Education and Culture, engaged with the Italian Foreign Affairs Minister to explore the establishment of Uruguay's first Industrial Design Centre. According to Bergara, part of the interview conducted in Section I, Chapter 4, the decision to follow the Italian model was influenced by Italy's development approach, which focused on supporting small and medium-size industries, as well as by a similar initiative developed with the collaboration of Italian institutions in Costa Rica. This project involved an assessment of the local manufacturing sector, which revealed that many manufacturing companies operated with outdated techniques, technology, and practices. Consequently, the envisioned role for the *Centro Diseño Industrial* (CDI) was to be deeply rooted in the country's reality, acting as a reference point in the formation of new designers who could contribute to design dissemination through practical engagement (Rosi, 2018).

The CDI, offering two streams – industrial and textile – served as the country's inaugural education experience in design at this level. As an independent institution under the purview of the Ministry of Education and Culture, its original philosophy focused on swiftly training technicians who were committed to full-time education (6 or 7 hours on-site), enabling them to enter the workforce in four years to address societal demands (Suárez, 2011). In 2005, an exploration of alternative institutional approaches occurred, with the resolution to reintegrate the CDI in the formal educational system. It led to the integration of the CDI into the Faculty of Architecture in UdelaR as an independent school (Suárez, 2011). Beyond institutional shifts, other pedagogical adaptations were introduced, such as reducing in-school hours to foster students' reflective capacity alongside practical skills (Suárez, 2011), making a paradigm shift from technical training to professional development. According to Bergara, part of the interview conducted in Part I, Chapter 4, the shift also redefined the purpose of design education. Previously centered on competitiveness and productivity, the new approach questioned the role of Design within the university context and explored who Design was for. The paradigm shift led to increased

collaboration and networks-building with other societal actors, such as micro-entrepreneurs and cooperative networks.

At postgraduate level, the CDI introduced seminars, courses and post-graduate programmes in various areas, including furniture, textile and fashion, packaging, control of quality, and business management between 2000 and 2002, although this lacked continuity (Suárez, 2011). In 2012, the first edition of the *Specialization Diploma in Furniture* was launched at the Faculty of Architecture. This programme is one of the postgraduate studies in design available in Uruguay and has persisted since then.

At pre-university level, several interesting courses have been developed in recent years as a part of the UTU. In 2019, the most significant initiative was launched: the *EMT in Design*, a course for the last three years of high school that prepares students for university entry[1]. While experiences were initially developed for the initial three years of high school , they were later removed from the curriculum.

Note 1. Educational system in Uruguay is organized into six years of primary school and six additional years of high school, which qualify students for university entry.

6.1.2 Design initiatives in Uruguay

The first professional industrial designers completed their studies in 1992, but their contribution was limited due to the intake of only twenty to thirty students per year. As a result, several design studios emerged, including Diseño Básico or Kairos y Cromos. With the institutionalization of design education, various organizations were established to unite designers. In 1995, the Asociación de Diseñadores Industriales y Textiles (ADIT) was formed, serving as an association that brought together industrial and textile designers (Fernandez & Bonsiepe, 2008).

In 2009, the *Cámara de Diseño del Uruguay* (CDU) was established, an association comprising design companies, independent designers, entrepreneurs and institutions in the design sector. The CDU's purpose is to provide a platform for coordinating and executing public and private strategic actions to position Design as a generator of economic, social, cultural, and environmental value, as well as an innovation driver for the productive sector (CDU, 2024). The CDU is part of the *Conglomerado de Diseño*, a public-private coordination entity composed of three sectors: the private sector represented by the CDU, the public sector with the Ministry of Industry, Energy and

Mining and the Ministry of Education and Culture, and the academic sector comprising both public and private educational institutions (CDU & TNU, 2011). The aim is to establish an institutional framework for the design and define strategic objectives for the sector. Consequently, they develop proposals to co-finance projects, often collaborative, that integrate Design into the productive sector (Conglomerado de Diseño, n.d.).

One of the significant activities organized by the CDU is a series of events held during June, to promote the design and engage designers. Since 2015, the CDU has organized annual activities that bring together designers from various domains, showcasing their work.

The development of Design in Uruguay is predominantly associated with furniture. It can be attributed to several factors, such as the prior involvement of architects before the formal education in Design was established, the commencement of postgraduate furniture design studies in 2012, and the international recognition of Uruguayan design in competition like the *Salão Design*[2] in Brazil.

Subsequently, furniture designers opted to establish an exhibition to promote products that were internationally selected or awarded during the year. This exhibition was named *Selección Uruguaya de Mobiliario* (SUM). The inaugural exhibition took place in 2013, featuring over 15 furniture pieces. This exhibition became an annual event until 2019.

In addition to the collaborative efforts among furniture designers for the exhibition, two lines of products were developed in 2018 and 2019 for display at the *London Design Festival*. The first, *Invisible threads,* drew inspiration from the drawings of Uruguayan modernist architect Julio Vilamajó. The second, *Poetic forms*, took inspiration from one of the cultural icons, the poet Juana de Ibarborou. Both collections were curated by Matteo Fogale. Fogale's (2021) intentions were to create unique pieces, free from constraints of marketing, production costs, or selling cost. His focus was on identifying elements that could set the creations apart in the market, and he believed the answer lay within the materials used (Fogle, 2021).

Matteo Fogale, a Uruguayan designer trained abroad, also shared his perspective on Uruguayan furniture design. He notes that defining Uruguayan furniture design is challenging due to its distinctiveness compared to other Latin American countries with stronger craftsman-

Note 2.
Salão Design is an award organized since 1988 by the Furniture Industries Union of Bento Gonzalves in Rio Grande do Sul – Brazil (Salão Design Award, n.d.).

ship traditions. While Uruguay historically looked to Europe for Design, it is recognised for using materials like wool and leather. Fogale describes Uruguayan Design as fresh, less influenced by extensive industrial experience. The use of natural materials and traditional techniques sets Uruguayan design apart (Fogale, 2021).

6.1.3 Design intervention in the local productive sector

To gain a deeper understanding of Uruguay's productive sector, the most recent survey on innovation in manufacturing and service companies, conducted by the National Agency of Research and Innovation (ANII) from 2016 to 2018, revels that 121.125 people are employed in the industry in Uruguay, accounting 26% of the companies in the industry and service sector. Moreover, only 5% are professionals and 4% are technicians (Hernandez *et al*., 2021).

The survey indicates that only 19% of Uruguayan companies engage in innovation activities. The primary innovation activities are the acquisition of software and databases (15%), acquiring capital goods (8%), and intern R&D (6%). Surprisingly, 56% of the companies are not interested in pursuing innovative activities. The main barriers to innovation include the small size of the market, concerns about the macroeconomic context, and the challenges in accessing funding (Hernandez *et al*., 2021).

Regarding association for innovation, only 6% of companies are connected with knowledge-producing institutions like universities or research institutes. The primary linkage between companies occurs through the market (24%). Moreover, the level of collaboration between companies is low, with only 9% participating in networking and 5% in cooperative agreements (Hernandez *et al*., 2021).

Specifically for the furniture sector, 24% of the companies engage in innovation, which is 5 points above the overall average. However, the average investment in innovation is the lowest among the industry sector. The predominant innovative activity is the acquisition of capital goods, accounting for more than 80% of innovations (Hernandez *et al*., 2021).

Numerus companies in the creative economy report challenges in finding avenues for innovation and developing new products and business models in collaboration with other economic sectors (Pastorino

et al., 2021). Additionally, for the productive sector, the significance of incorporating creative industries as a factor of innovation or as a business strategy remains relatively low (Pastorino *et al*., 2021). Consequently, the availability of public funds for Design development has not only impacted the growth of the discipline but also its connection with the productive sector. Notable examples of such programmes are: *PRODISEÑO*, *Fondo Naranja*, *Fondo Semilla*, and *Voucher de innovación para las industrias creativas*.

Those programmes promoted the integration of design with the productive sector through financial and collaborative support. However, only *PRODISEÑO* remains available because its focus is more on the communication area, while product development involves higher investments not covered by the programme. Moreover, the assessment of vouchers for the creative industries revealed valuable insights. Designers evaluating the programme stressed the importance of creating more opportunities for connection, exchange and exploring collaboration possibilities (Pastorino *et al*., 2021). Coordinators of the programme highlighted the need to assist companies from different sectors in discovering potential synergies, thus enhancing collaboration and creating shared understanding (Pastorino *et al*., 2021).

6.2 Design Studios in Uruguay and Their Role in New Product Development

To gain a deeper understanding of the overall situation of the design field in Uruguay, design studios play an essential role as they actively contribute to the development of the discipline. Therefore, design studios part of the *Cámara del Diseño de Uruguay* (CDU) were analyzed in the categories of product design and furniture. Data collection involved analyzing the design studios members of the CDU, supplemented by information about the services or products offered by each studio. This approach enabled us to understand the NPD process in the country and initiate an exploration of the studios' interactions with manufacturing companies (figure 2).

From the final list, it became apparent that 8 of these companies primarily focused on furniture design, while 5 were involved in the

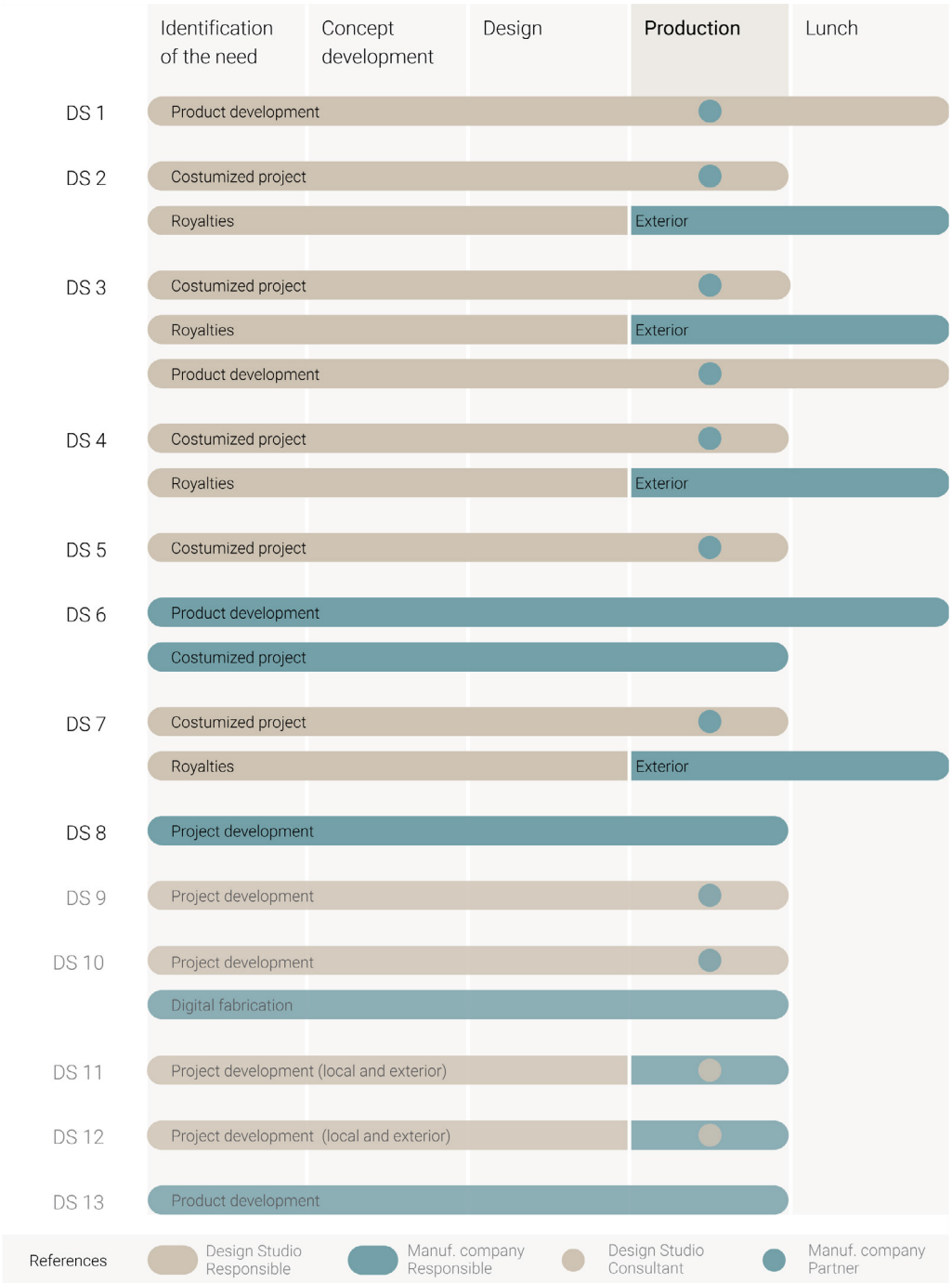


Figure 2.
Map of Design Studios in Uruguay (developed in June 2023).

creation of other types of products. This included two companies mainly working with plastic products, one specializing in eyeglasses, and another involved in digital fabrication.

The division of the NPD process into various phases allowed us to identify how these design studios related to manufacturing companies. For those not involved in furniture design, they acted as product producers or provided consultancy on production but were not responsible for its execution.

However, in the case of locally produced furniture design, the design studio assumed responsibility for production, even though, in most of the cases, the manufacturing process was outsourced. This means that designers were hired to produce a product rather than providing design service. Consequently, design studios and manufacturing companies became partners throughout the process, working together to achieve common objectives.

For furniture designed in Uruguay but externally produced, primarily in Brazil, the relationship was different, as design studios sold the product royalties and were not responsible for the final two phases, production and launch.

DS 1 stands out as the only company with products available for sale without designing for specific projects. They maintain an online product catalog that allows for customization. In contrast, all other design studios in the furniture sector create customized projects for each client, although some studios also have other approaches to the NPD process. Furthermore, none of the furniture studios maintain stock products in the local market, ensuring that all the products remain customizable.

In conclusion, the map highlights the predominant studios engaged in furniture design alongside other types of products. Within furniture design, there is a division in terms of designers' role in production, depending on whether the production is local or international. Furthermore, a predominant NPD process type involves studios designing specific projects for each client.

6.3 Categorization of NPD Process in Furniture Sector

Based on the insights gained from the previous map, with a clear influence of the furniture sector, it was decided to concentrate on this area. Specifically, the NPD process for furniture was divided into three categories: Product Development, Customized Project, and Royalties. Each category was analyzed to understand the role and the responsibility of the design studio throughout the process, the relationship with the manufacturing company, and specific examples. This analysis aimed to provide a better understanding of how design studios develop their projects.

Building upon the previous mapping exercise, categories of NPD process emerged and were systematically organized. To provide a clearer understanding of the product characteristics within each category, specific examples were included (figure 3).

6.3.1 Product development

This category places the design studio in charge of the entire NPD process, from the identification of the need to product launch. The process often begins with the studio's own interest or the intention of establishing a presence in the market. Furthermore, the studio takes responsibility for the production, which is frequently outsourcing, and the launch of the product. In this case, the initial effort is made by the design studio.

An example of this category is Samago, which maintains online catalogs where clients can purchase their products, even though they are now more focused on customized projects. Clients have the option to choose from different variations, and some request minor customisations of the furniture. An example of this category is the rack *LAZO,* which won first place in the *Panel Use Challenge* category at the *Salão Design* Award 2020.

6.3.2 Customized project

Starting from a client's requirement, whether an individual or a company, the design studio is responsible for the entire NPD process from the inception to the production. Similar to the previous category, the

Examples of categories within the NPD process in the furniture sector

Product Development
Lazo rack by Samago

Custumized project
Sofa by Menini Nicola

Royalties
Catalá buffet by MUAR

Figure 3.
Classification of NPD process.

production process falls under the design studio's purview and is often outsourced. The NPD process concludes after fabrication since there is no product launch phase, the final product is tailored to a unique client.

This model does not pose a significant risk for the studios, as clients engage them before the project begins. Consequently, most of the design studios analyzed work within this modality. For example, Menini Nicola developed the sofa shown in the example for the hall of a residential building.

6.3.3 Royalties

The primary distinction in this category compared to the previous ones lies in the production and launch phases. In this case, the process may originate from the design studio's own interest or a company's requirement. However, the manufacture and sale of the product are not the designer's responsibility, although collaboration between both parties is possible. This production model is typically for production outside Uruguay, often in Brazil. Additionally, Uruguayan designers participate in international contests to gain more visibility and sell their projects. A notable example of this category is MUAR with the *Catalá buffet*, commercialized by Saccaro.

This categorization reveals several key characteristics of the NPD process in Uruguay. Firstly, with the exception of the first design studio (DS 1), all design studios primarily engage in customized projects. Furthermore, in most cases, this modality is complemented by another model, indicating that the majority of studios undertake individual projects for each client.

Regarding manufacturing, the relationship between these actors varies between local and international contexts. When production takes place abroad, typically in Brazil, designers are not responsible for this phase. However, local production falls under the responsibility of the design studios. This means they are not merely providing a service but delivering a final product, and manufacturing companies depend on the projects developed by designers.

Consequently, it can be observed that manufacturing companies do not hire designers to create products. Moreover, the existence of a third actor who hires the design studio for design and a manufacturing company for production, is not prevalent in Uruguay.

7. Lacking Collaborative Guidelines for New Product Development in Uruguay

To delve deeper into the relationship between designers and the furniture industry, three interviews were conducted. These included one with a design studio and two with different carpentry workshops. The aim was to uncover the intricacies of the collaborative process and identify any challenges or barriers encountered during such collaborations.

7.1 Insights About Designers' Work

To gain a broader context of the design in Uruguay, several interviews were conducted with a referent in the design field. These interviews provided a deeper understanding of the local situation and served as a validation of the findings from the previous steps. Through the collaboration of the Uruguayan designer Carlo Nicola, valuable insights were gathered to complement the existing information.

During the interviews, several topics were discussed, primarily focusing on the influence of product designers in the industry, the

characteristics of the design studios' work, the relationship with manufacturing companies, and the vision of the design activity. The aim was to gain a better understanding of the state of the design in Uruguay and to compare Nicola's perspective on design with the gathered information.

7.1.1 Design areas of influence

As previously observed, most design studios in Uruguay operate in the furniture sector, a fact confirmed by Nicola. He mentioned that these studios often collaborate with carpentries, iron workshops, and occasionally upholstery workshops. However, when it comes to plastic production in Uruguay, Nicola stated that there is little room for more than two design studios due to the small domestic market and the high cost of exporting products. On a different note, he highlighted the potential of ceramic workshops to thrive given their basic technology and historical significance in Uruguay's industrial sector. He also mentioned the existence of experimental workshops exploring materials like felt or glass.

Regarding furniture design, he explained that this sector encompasses various areas of work, such as residential and corporate furniture, which contribute to the dynamic and competitiveness of the local market. Nicola pointed out that, following the pandemic, high-end furniture produced in Uruguay has similar costs to those produced in Asia. However, Uruguay holds an advantage in terms of shorter delivery times and more customized products, making local production competitive in this sector. Additionally, there are well-established carpentry workshops locally.

7.1.2 Designers' role

A distinctive aspect of furniture design in Uruguay is that each project typically results in a limited number of products, often unique pieces. This characteristic, as seen in the customized project category mentioned earlier, was corroborated by Nicola. He added that the market is not receptive to local standardized production because the effort required is not justified. In furniture design, the primary mode of operation involves selling the service or product on a per-unit basis.

In this dynamic of work, Nicola noted that clients often mistake that design studio as the producer and may not fully understand the distinction between the design and production phases. As a result, clients expect the design studio to deliver the final product, leading design studios to take multiple roles.

7.1.3 Relationship with manufacturing companies

According to Nicola, the relationship between designers and manufacturing companies is typically challenging. His design studio actively seeks approaches to work harmoniously with producers, presenting drawings clearly and proposing innovative solutions without disrupting the established workflow. He mentioned that achieving shared understanding between designers and manufacturers can be challenging due to differing mental models, as an intangible yet crucial aspect of collaboration. He offered a practical example: the design brief is essentially an agreement of an idea that does not exist yet. Thus, making this idea explicit is essential since the producer may lack the tools to do so.

To address the challenge of shared understanding, Nicola suggested that designers need more experience working with manufacturers, even while they are students. Some carpentries may believe they do not need to work with designers internally because they lack prior collaborative experience. For these producers, designers are seen as external to the company, coming in solely to produce and then leave it. In Nicola's view, while this approach can yield economic benefits for carpenters, it hinders the collaboration product development experience.

7.1.4 External and local vision of the design activity

Nicola shared his experiences working with various productive systems, ranging from the highly artisanal approach in Uruguay to mass production in Brazil. He highlighted key differences between the two. In Brazil, the system is accustomed to work with designers as a commercial tool and as a source of innovation. Consequently, Brazil employs a more automated production process compared to Uruguay, resulting in less direct interaction with the individuals operating the machines. As a result, the relationship is somewhat less personal.

On the other hand, in Uruguay, the relationship between designers

and manufacturers is more direct and personal. This approach has advantages, such as the potential for more artisanal and personalized results. However, it also has drawbacks, including the risk of designers disrupting workshop logistics or making proposals that may not align with manufacturer's possibilities.

7.2 Insights About Carpenters' Work

The primary aim of this first part is to gain a better understanding of carpentries in Uruguay, a unique sector dedicated to furniture manufacturing. Interviews were conducted with Pablo Ferrer from Zona M, Heber Coitinho from Mundomadera, and Carlo Nicola from Menini-Nicola, during which various topics were discussed to provide a deeper comprehension of this productive sector, with a particular focus on carpentries characteristics and their work practices.

7.2.1 General characteristics of the carpenter workshops

According to Heber Coitinho, who serves as a part of the directive of the carpenters' association, there are approximately 8000 carpenters, including home-based workshops. Out of this number, around 2500 carpenters have employees, and only 80 carpenters have a technical department. Both of the interviewed carpenters fall into the latter category.

Carpenters are accustomed to producing diverse projects for each client, with proposals that are consistently unique and customized. This flexibility, coupled with specialized workforce, makes carpentry workshops versatile spaces. These projects encompass residential and corporate furniture.

In terms of clients, both carpentries work closely with architects and designers. Additionally, Ferrer noted that his clients are increasingly companies rather than individual consumers, as had been the case previously.

7.2.2 Modality of work

One of the initial questions that arose in the research was why carpentries in Uruguay do not have their own product lines. During the

interviews with these three professionals, they explored potential reasons, all agreeing on a common answer: it is not feasible to maintain a product line in Uruguay.

The primary reasons were associated with external factors, including the small size of the domestic market and the high cost of exporting products. Moreover, the considerable effort required for developing a new product for mass production is often challenging in terms of sales. Additionally, this involves a different set of machinery, logistics, and the need of a dedicated sales outlet.

For the model of work to which carpentries are accustomed – one that relies on specialized workforce and workshop adaptability – customized projects are the ideal fit. This model aligns with the nature of their work.

7.2.3 Role of technical drawings

Throughout the entire interaction process between designers and carpenters, technical drawings play a crucial role in communicating the product. These representations are utilized from the initial quotation phase to the manufacturing stage, undergoing modifications as the process evolves.

According to Pablo Ferrer, the clarity of technical drawings depends on the designers' expressiveness. However, it is essential for these drawings to be unambiguous in terms of dimensions. Furthermore, the use of explanatory notes is highly recommended to enhance comprehension of the product. Therefore, an important aspect of technical drawings is not only to present the product clearly but also to emphasize the fundamental aspects for better understanding.

Moreover, during the interview with Ferrer, the concept of a disconnection between the technical drawings and the feasible manufacturing possibilities of the product emerged. Some carpenters hold the belief that designers create aesthetically pleasing technical drawings, but the resulting product is often impractical to manufacture. This represents another point of misunderstanding between the two parts.

7.3 The Journey Map of Collaboration

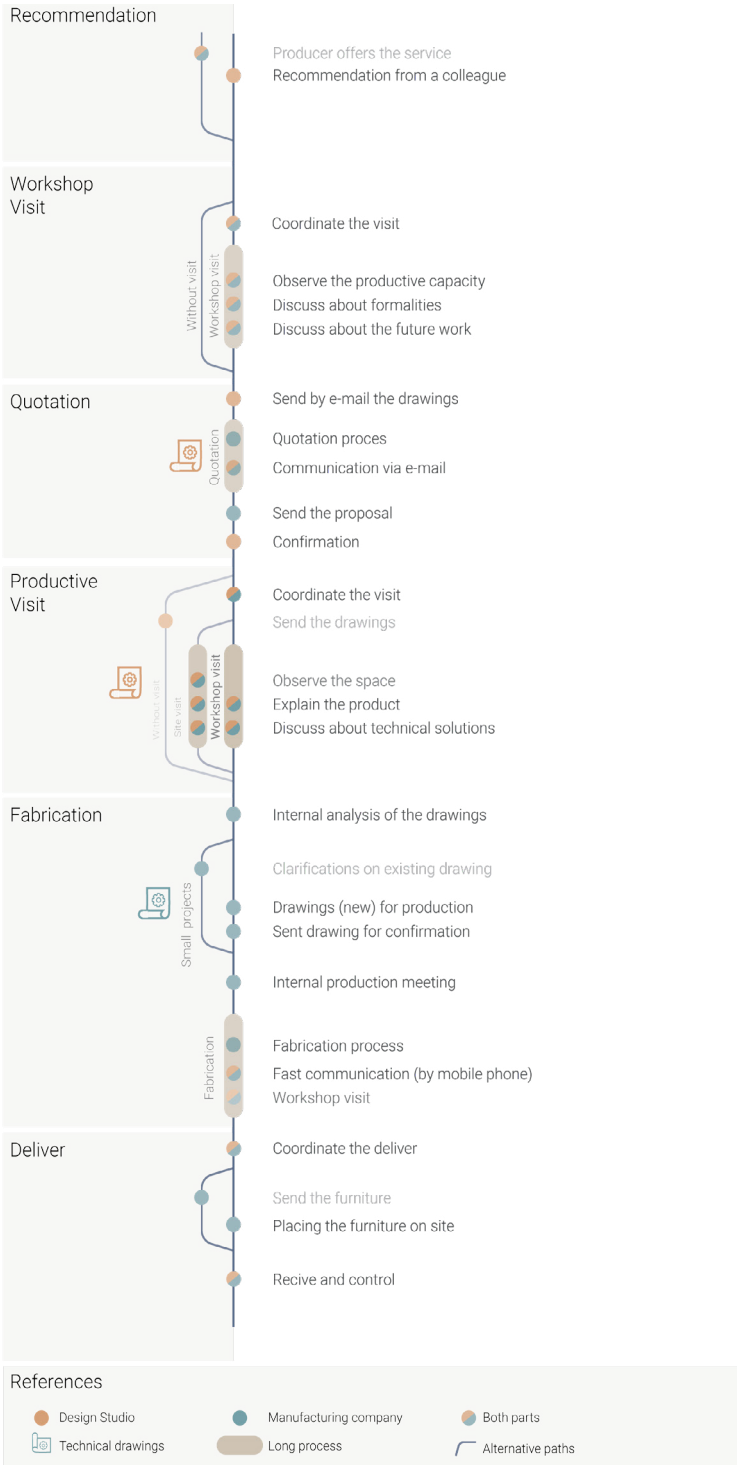
In the third chapter, the phases of the NPD process were analyzed in relation to the interaction with manufacturing companies. This section focuses on the production stage. The purpose of this map is to visually represent the entire process of interaction between design studios and carpenters and to observe the phases of their collaboration (figure 4). The map shows an ideal collaborative situation for the first time, so the parties have no experience working together. When the actors have more experience as partners, some of the steps are not necessary, such as the initial recommendation.

The map is divided into different phases of the collaboration, including recommendation, workshop visit, quotation, productive visit, fabrication, and delivery. Each phase consists of various steps, represented by circles. These circles are color-coded to indicate the responsible party of each action, either the design studio, the manufacturing company, or both, if it involves both parties. Additionally, longer processes are grouped to indicate that a single activity encompasses multiple steps. Alternatives paths are also represented to demonstrate the different interaction possibilities, depending on the project's size and the level of experience working together.

The map highlights that designers have a more substantial role in the collaboration until the fabrication phase, where the producer assumes the responsibility for product development. Before reaching the fabrication phase, both parties must collaborate closely, allowing the designer to transmit the product's vision, and together can refine the final production details.

Throughout the process, technical drawings play a crucial role, primarily serving as intermediaries between the parties and as a tool to explain the product. During the quotation phase, the designer presents preliminary drawings to the manufacturer, providing an understanding of the idea without excessive details. As they progress to the productive visit, more detailed drawings are presented and discussed. Finally, the manufacturer develops the final technical drawings, incorporating all the necessary details and translating them to workshop instructions. The product becomes more refined with evolution of the drawings throughout the phases of the collaboration.

Figure 4.
Map of the process of collaboration.



7.4 Barriers and Enablers

From the interview, we not only gained insights into how the collaboration process unfolds but also identified the barriers and enablers that are critical at each phase, as well as the important considerations for both actors during their interactions. In this context, enablers refer to actions that facilitate collaboration, while barriers denote actions that obstruct the process.

For the designers (table 1), a crucial aspect is selecting the right manufacturer for the project, one who possesses the commitment and skills to execute it effectively. Barriers are often based on the manufacturer's experience with similar projects and their level of commitment. Conversely, enablers are associated with effective communication between the parties.

Table 1.
Barriers and enablers from designer's perspective.

Designer's perspective		
Enablers	**Barriers**	**Focus / Importance**
Recommendation		
Feedback and insights from colleagues who have previously collaborated with manufacturers.	Manufacturers lacks of prior experience in producing similar products.	Designers bear the responsibility of ensuring quality to meet customer expectations.
Workshop visit		
Sufficient and clear communication between the involved parties.	When manufacturers fail to attend or cancel meetings promptly.	Understanding manufacturing capabilities to ascertain the best approach.
Quotation		
Commitment to respond within the set timeframe.	Manufacturers that are not used to work with technical drawings, and request images or sketches.	Pricing products in accordance with market value.
Productive Visit		
Willingness to discuss and consider innovative or unconventional solutions.	Manufacturers' assurance of understanding the concept but implementing something different.	Mutual agreement between both parties on how to produce the product
Fabrication		
Clear communication about essential aspects of the projects.	-	Trusting the manufacturer to execute the project as agreed.
Deliver		
Limiting on-site assembly, as it can sometimes be challenging to manage.	Lack of time to rectify mistakes once they are discovered.	Avoid stressful situations due to tight deadlines and unforeseen circumstances.

For the carpenter (table 2), the primary focus in each phase is to ensure a clear understanding of the project. Barriers typically arise from misunderstandings and a lack of comprehension between the parties. Enablers are linked to effective communication, especially in explaining technical drawings, as well as showing empathy, listening, and demonstrating flexibility during negotiation.

The designer bears the responsibility of choosing the most suitable manufacturer for the project and effectively transmitting the product's vision through clear communication. Carpenters, on the other hand, are responsible for comprehending the product and successfully producing it. Both parties share the commitment to be open to the others' work and perspectives, fostering a collaborative environment.

Table 2.
Barriers and enablers from carpenter's perspective.

Carpenter's perspective		
Enablers	**Barriers**	**Focus / Importance**
Recommendation		
-	-	-
Workshop visit		
When the designer is aware of the supplier and the available production capabilities.	Lack of alignment on vital information that needs to be conveyed.	Understanding whether it is the best option to proceed with the designer.
Quotation		
Comprehensive technical drawings and explanatory notes that thoroughly outline the product.	Drawings that lack necessary details and information.	Understanding the project thoroughly to provide accurate quotes.
Productive Visit		
Being receptive, empathetic, and attentive to understand the designer's perspective.	Challenges when the end-client's expectations are unrealistic or infeasible.	Providing guidance to arrive at the best technical solutions.
Fabrication		
Quick and effective communication to address any queries or uncertainties promptly.	Differences between internal technical drawings and those provided by the designer.	Ensuring clarity about the project before the onset of this phase.
Deliver		
Maintaining a professional appearance and ensuring that the furniture arrives adequately protected.	-	The recuperation and customer satisfaction are at stake during this phase.

7.5 Challenges in the Collaboration

Based on the information collected and analyzed, the objective of this section is to elucidate the challenges inherent in the collaboration between both parts, focusing on the primary difficulties experienced during their interactions (table 3).

These challenges can be categorized into three distinctive types: lack of experience working together, not respecting each other's works, and lack of trust on each other's knowledge. Within each of these problem categories, there are specific challenges for both designers and carpenters.

For designers, challenges are linked to effectively communicating the project's vision and understanding the role that the manufacturer plays throughout the collaborative process. Conversely, manufacturers face challenges related to their willingness to adopt the designer's proposals. By identifying and addressing these challenges, it becomes possible to enhance the collaborative dynamics between designers and carpenters.

Table 3. Challenges of the collaboration.

Designer perspective	Manufacturer perspective
Lack of experience working together	
Designing without considering the technical possibilities of the carpentry.	Initially lacking flexibility to innovative with new proposals.
Proposing changes that modify the producer's work-flow dynamics.	The preconception that designers lack knowledge anything and want to instruct manufacturers on how to work.
Frequently changing producers from one project to another.	Knowledge being derived from experience, leading to vary work methods from one company to another.
Not respecting each other's work	
Providing insufficient information about the entire project.	Inadequate manufacturing precision in relation to the original proposal, resulting in differences in objectives.
Falling to involve the producer in the process.	Undervaluing the work of the designer, particularly the design process.
Lack of trust on the other's knowledge	
Require recommendation from a colleague or the need to see similar previous objects.	Not relying on designers' technical solutions.

8. What Happens When Collaboration Conveys Diverse Know-How

This chapter is dedicated to gain a better understanding of collaborative dynamics in Design from a theoretical perspective. In the previous sections, several characteristics related to design in Uruguay were observed, including its small scale production, the disconnection between Design and industrial sector, and the manner of working as partners in production. Therefore, collaboration between designers and manufacturing companies is essential in the product development structure in Uruguay. As a result, the quality of the interaction and integration of the actors will influence the outcome (Sanders and Stappers, 2008). Consequently, a theoretical understanding of collaboration in Design proves to be an invaluable means for comprehending their relationship and strengthening collaborative practices.

8.1 Defining Collaborative Design

The complexity of the design work demands a continuous collaboration to support more responsible processes and outcomes (Vita, 2023).

Various terms have been used for collaboration in the field of Design, such as Co-creation, Co-design, or Participatory Design, which may have different origins but share the common principle of involving people in the design process and outcomes (Vita, 2023). According to Sanders and Stappers (2008), the collective practice of creativity in Design has been referred to as Participatory Design since the 1970s. The concept originated in Nordic countries, where it was believed that involving workers in the process would enhance the value of industrial production (Sanders & Stappers, 2008).

Furthermore, according to Kleinsmann, the definition of collaborative design is as follows:

> **the process in which actors from different disciplines share their knowledge about both the design process and the design content. They do that in order to create shared understanding on both aspects, to be able to integrate and explore their knowledge and to achieve the larger common objective: the new product to be designed. (2006)**

This definition appears to align with the concept explored in this thesis, as it is broad yet specific to the collaboration between designers and other actors with different backgrounds, as is the case of manufacturing companies.

8.1.1 Collaborative actors

During the collaborative new product development (NPD) process, actors from different fields present their viewpoints, proposals, and considerations to contribute to the final product's form (Bucciarelli, 2002). Each party holds their unique perspective and responsibilities within the team, relying on each other's knowledge for successful task completion (Kleinsmann, 2006). Consequently, both knowledge-sharing and knowledge-integration are critical to the success of the design process (kleinsmann *et al*., 2010).

Apart from the core team members, specialists can also contribute to the project. Those specialists are experts in particular subjects and can provide valuable insights for solving problems more efficiently. However, they are not directly involved or responsible for the

project. Instead, they offer proposals that the team will evaluate their relevance and potential impact. (Andreasen *et al*., 2015)

Moreover, when interacting with external actors, suppliers or practitioners, both formal and informal interactions are important for developing a common understanding of both the process and the final product. Workshop, presentations, or site tour, therefore, play a significant role in building synergies and fostering mutual familiarity (Le Dain *et al*., 2020).

The key actors in this case are the designers and the manufacturing companies. However, it is essential to make certain considerations. In the furniture sector, both parties should collaborate as partners during production and decision-making processes. However, manufacturing companies sometimes act as specialists offering insights, but they do not partake in decision-making. Additionally, the interaction between these actors is similar to that with external collaborators, emphasizing the importance of developing a common understanding.

8.1.2 Collaborative structure

In order to collaborate effectively in teams, the structure plays a vital role in achieving set agendas and goals. However, if the work environment is overly structured, it can potentially hinder creativity (Andreasen *et al*., 2015). According to Le Dain (2020), formal socialization provides the necessary structure for effective team member integration, while informal socialization mechanisms are also crucial for knowledge sharing and mutual learning.

During the collaborative negotiation process, frames are built to enclose the problem and the solution space to take actions that lead the team to effective decisions and knowledge integration (Kleinsmann, 2012). Frames can be created through three activities: naming – identification of important elements that needs explicit attention–, moving – development of ideas, exploration of problems, or investigation of design decisions that contribute to reframe the problem –, and reflection – questioning decisions taken to have insights of the progress and quality of the process (Valkenburg and Dorst, 1998). Therefore, frames guide the team towards further steps (Kleinsmann, 2012).

Creating a common understanding and facilitating team exchange during the early phases of the project are crucial for achieving pro-

ject goals (Le Dain *et al*., 2020). These initial interactions provide a foundation for clear understanding of the project's rationale and the establishment of a collaborative framework (Le Dain et al, 2020). In particular, Sanders and Stappers (2008) emphasize that the integration of all the actors from the idea generation and throughout the design process, particularly during decision-making moments, can significantly influence the design outcome.

8.1.3 Characteristics of collaborative design

According to Kleinsmann (2006), collaborative design contains three principal characteristics: knowledge creation and integration, communication among actors, and creation of shared understanding.

Knowledge is more than a mere accumulation of recorder information, it includes the ability to register and remember late. As per Kleinsmann and references therein (2006), a distinction can be made between tacit and explicit knowledge. Explicit knowledge can be systematically communicated in a formal manner, whereas tacit refers to the mental models specific to a given situation and context. Therefore, actors should be capable of transferring tacit knowledge into explicit knowledge and vice versa (Kleinsmann, 2006).

Throughout the collaborative process, there is a cycle of knowledge creation, where actors with diverse knowledge bases elaborate their own frames, which represents the divergent part. Conversely, during the process of knowledge integration, actors share their knowledge, constituting the convergent part (Kleinsmann, 2006). The integration of knowledge should lead to insights to the success of each member's task (Kleinsmann, 2006).

Communication among actors is mainly concerned with what to communicate, how to do so, and what medium to use (Andreasen et al., 2015). According to Kleinsmann (2007) key elements in the communication of multidisciplinary teams include the use of jargon that hinder outsiders' understanding, as well as different methods of representations of design which can lead to varying levels of abstraction. Therefore, the effectiveness of design communications relies on minimizing the gap between actors and developing shared understanding (Kleinsmann, 2007).

According to Kleinsmann (2006), these frames enable actors to create shared meaning, directly linked with structures. However, the heterogeneity within teams is associated with innovation, flexibility, and creativity, yet differing perspectives can lead to a reduction of shared understanding (Cash *et al.* and references therein, 2017). To counteract this negative impact, a crucial step is developing a common understanding through the use of a framework that enhances interaction (Cash *et al*., 2017). Therefore, if creating a shared meaning is a challenge, it becomes necessary to assess the formal frameworks (Kleinsmann, 2006).

Mental models represent insights and comprehension of something, and when shared, a common model is created (Andeasen *et al*., 2015). These shared mental models aid in understanding and agreeing upon the process and the design content, thereby forming the frames for team collaboration. The mental models that are shared in a team reflect the shared understanding of the actors (Kleinsmann, 2006).

As a result, to achieve effective collaboration in the design process, actors must possess the ability to create and integrate knowledge through design communication. Moreover, the quality of this communication is influenced by the presence of shared understanding (Kleinsmann, 2006).

8.1.4 Boundary objects

When heterogeneous groups collaborate in the design process, managing varying agendas and goals becomes a central concern (Islind *et al*., 2019). Incorporating resources to facilitate collaboration, such as objects or representations, can play a crucial role in creating shared understanding (Islind *et al*., 2019). Boundary object is something that can be understood from multiple parties without requiring a full understanding of every detail (Andreasen *et al*., 2015). In essence, it serves as a bridge in communication among the actors (Islind *et al*., 2019).

According to Carlile (2002), boundary objects possess three main characteristics: the shared syntax or language that enables members to express their knowledge, semantics that allow actors to learn and specify the differences and interdependencies, and pragmatics that facilitate the joint transformation of individual knowledge. These characteristics provide the necessary framework for representing,

learning and transforming shared understanding (Carlile, 2002).

Various items can serve as boundary objects, including documents, contracts, rules, plans, drawings, sketches, or models, which actors from different disciplines can interpret (Andreasen *et al*., 2015; Stenfors *et al*., 2004). These elements contribute to creating coherence throughout the project and enhance team organization and decision-making (Andreasen *et al*., 2015).

Particularly in the design field, drawing-based communication is key for teamwork, as drawings serve as standardized tools for comprehension, with the precision necessary for those who know the codes (Andreasen *et al*. and references therein, 2015). However, drawings also have limitations, as they may not explicitly transmit which is the critical information. Consequently, they can be both convincing and devoid of meaning (Andreasen *et al*., 2015). As a result, visual communication, a key element supporting teamwork, is frequently complemented by verbal explanations (Andreasen *et al*., 2015).

8.1.5 Collaboration between designers and craftsman

Craft and industrial knowledge are interconnected areas that have a mutually beneficial relationship, as craft influences industry, and vice versa (Woolly, 2011). Craftsmen within the industry context bring valuable insights to the practice due their expertise in materials and techniques (Woolly, 2011). Additionally, artisans possess the skills and flexibility necessary for the production, allowing them to identify problems and solutions with efficiency (Temeltas and Kaya, 2021).

The knowledge incorporated within the craft process is primarily tacit, derived from experimental and informal learning (Temeltas and Kaya, and references therein, 2021). This type of knowledge is not transmitted through words but is shared through collaborative actions (Temeltas and Kaya, 2021). Consequently, from the design perspective, engagement with artisans results in mutual learning, where designers can acquire this tacit knowledge (Temeltas and Kaya, 2021).

However, this perspective of the crafts as a merely knowledge resource for the industry overlooks the intrinsic value of the artisanal work. According to Morales (2015), designers trained under the perception of modern design are ill-prepared to act in the field of craft, as in the peripheral countries, it serves as a means of producing objects

rather than solely being viewed as an artistic or cultural activity.

In a study conducted in Chile exploring the relationship between designers and artisans, Cattan Lavin (2019) reveals that the participants perceive this relationship unbalanced. Artisans are frequently regarded not as partners, but merely as suppliers of the workforce. When designers approach the collaboration from an outsider standpoint, it becomes challenging to encourage genuine inclusion and engagement with craftsmen (Cattan, 2019). Hence, understanding the artisanal approach is a collective learning process.

8.2 Analysis of Existing Tools

To strengthen the collaboration between design studios and manufacturing companies, various tools were analyzed. The goal was to understand how to enhance shared understanding between multidisciplinary teams and facilitate their interaction. According to Stenfors *et al.* (2004), tools are instrumental in solving practical problems by supporting effective interaction. While their research primarily focused on executive contexts within companies, these principles can be applied to situations where professionals from different sectors need to collaborate.

Their study identified key features for the usability of such tools:

- *simplicity*: tools should be easy to understand and learn;
- *support for social interaction:* they should create an environment conducive to communication;
- *connections to the actual context*: tools should be linked to the specific context where they are used;
- *flexibility*: tools should only be used when needed (Stenfors *et al*., 2004).

Furthermore, tools from the IDEO were examined (IDEO, n.d.). While not directly addressing the thesis problem, they provided some valuable insights:

- *quick sketches, drawings and graphs*: these can bridge language barriers and convey ideas effectively (Tool: *Draw it*);
- *conversations starters*: words or images that stimulate reactions and guide discussion (Tool: *Conversation starter*);
- *objectives*: Writing down objectives helps align shared under-

standing and maintain focus (Tool: *Align on your impact goals*).

From these tools it was possible to identify insights, such as the use of elements to identify topics to discuss, the inclusion of drawings to support ideas beyond verbal language, and the importance of maintaining focus to align the mental models and guide the discussion.

Additionally, various other tools were analyzed to gain a broader perspective on creating shared understanding and supporting decision-making in multidisciplinary teams. Although these tools were developed for slightly different scenarios, they offered some interesting elements for the development of the new tool:

- *Tangible brief and the positions, perspectives and priorities*: these are artifacts that encourage spontaneous discussion and negotiation, creating infrastructures for the collaboration (Andersen & Mosleh, 2021);
- *Kantjil game*: a simulation-based training that assigns participants roles, making negotiation essential to establish common objectives. The results highlight the need to develop the ability to share and integrate knowledge (Kleinsmann *et al*., 2012);
- *Organizational kit game:* a simple game that uses cards to discuss meaning and create common understanding (Brandt, 2006). It may serve as conversation starters to align mental models;
- *Floor it*: a tangible tool that fosters idea development without personal attachment, promoting collective solutions involving all parties (Van Dijk & Van Der Lugt, 2013);
- *Defining goals through collaboration*: this tool supports the practice of negotiation and consensus-building through an iterative process that frames decision-making and fosters the development of a shared language (Zahedi & Tessier, 2019).

The analysis provided by these tools offers a broader perspective on the process of creating shared understanding within a team and supporting negotiation. The table 4 demonstrated how these theoretical concepts were applied in practical actions in the tools, serving as reference for the development of the new tool.

Such a synthetic representation of the design process helps take an extra step in the analysis. That is, to investigate the consolidated

Tool	Focus	How
The tangible brief (Andersen & Mosleh, 2021)	Encourage negotiation and spontaneous discussions.	Divide and organise the aspects to discuss.
Positions, perspectives and priorities (Andersen & Mosleh, 2021)	Discuss with actors with different perspectives.	Promote negotiation and prioritization different requirements.
The Kantjil game (Kleinsmann *et al*, 2012)	Negotiation with actors with different roles and objectives.	Through negotiation, create a balance between each participant's objectives.
The Organisational Kit Game (Brandt, 2006)	Creation of shared understanding.	Use visual elements to create shared meaning among the participants.
Floor-it (Van Dijk & Van Der Lugt, 2013)	Creation of innovative solutions within a team.	Combine ideas without personal attachments.
Defining goals through collaboration (Zahedi & Tessier, 2019)	Negotiation and consensus-building.	Iterative process that frames decision-making.

Table 4.
Analysis of the tool.

methods used in each phase by designers to reach their goal and check for new contemporary methods that represent the latest way designers are tackling today's challenges.

When analyzing tools aimed at fostering shared understanding and negotiation in multidisciplinary teams, it becomes clear that these are not limited to paper-based solutions. Digital platforms increasingly support collaborative work by enabling simultaneous editing, facilitating collective visualization of information, prioritizing and aligning decisions, and providing real-time communication. Such tools enhance participation and contribute to the creation of common frameworks that strengthen collaborative processes (Yu *et al*., 2024).

More recently, the development of AI-based tools has introduced new possibilities for bridging collaboration gaps and mediating interactions among participants. These tools can reinforce shared understanding, provide structure to collaborative exchanges, and facilitate negotiation processes. Human-AI collaboration offers several key capabilities, including the optimization of resource allocation, performance enhancement, effective adaptation to dynamic environments, and support in addressing complex problem-solving tasks (Song, 2024). These functions are particularly relevant for positioning AI as a potential mediator between actors.

9. Collaboration as a Catalyst: What Can Happen in the Furniture Sector in Uruguay

This second part of the book focuses on design in Uruguay, providing insights into the characteristics of the design process for the design studios and their relationships with the manufacturing companies. It became evident that one of the most influential areas for design studios in Uruguay is furniture design, with studios developing specific projects while collaborating with the manufacturing companies as a partner in the production phase.

Furthermore, it deepened the understanding of the working dynamics between designers and manufacturing companies. The distinct characteristics of furniture production in Uruguay, including project customization, small-scale production, unique pieces, flexibility, and adaptability to various productive techniques, underscored the importance of creating a collaborative environment to achieve the common objective of production.

However, challenges in collaboration during the production phase were also identified. As observed previously, the primary issues were related to the lack of prior experience working together and a limited understanding of each other's work. These challenges align with find-

ings from the second chapter, which indicated a technological gap in Latin America, including Uruguay. This gap contributes to a disconnection between the industry sector and the scientific and academic system (Cabrera, 2016). Therefore, the collaboration challenges between designers and manufacturing companies can be viewed as everyday problems, but they also have a structural component tied to the characteristics of the industrialization process in the region.

9.1 Insights as Enablers for Building Bridges

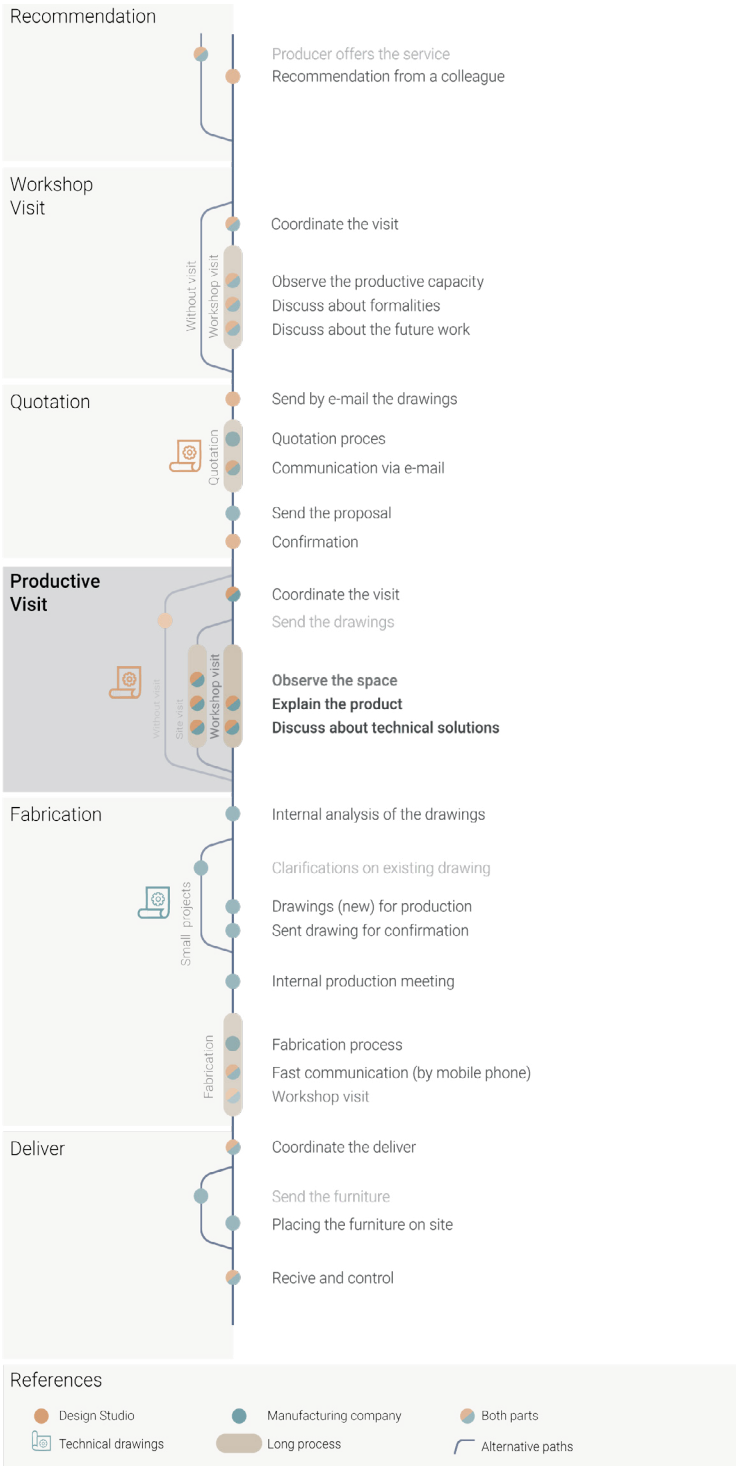
The challenges in collaboration between both parties are primarily associated with their level of experience working together, as it influences their ability to understand each other's work process and to respect their respective processes. Within the framework of the production process, there are specific instances where designers and carpenters come together.

First crucial instance is the on-site visit to the workshop, which occurs before the beginning of the production (figure 5). While this event may not occur on every occasion, it was emphasized by the carpenters as being essential for comprehending work modalities, exploring productive possibilities, and building mutual knowledge. Furthermore, having this opportunity to visit the workshop helps to foster synergies and the development of a shared understanding (Le Dain *et al*., 2020).

The second significant instance is the productive visit, during which both parties must engage in discussion to define an innovative and feasible product. This meeting is a pivotal step in the establishment of common understanding, as it represents a phase of knowledge integration. Up to this point, each party has constructed its own frames for both problems and solutions. The *Productive visit* marks the inception of the convergent phase, where actors must share their knowledge, resulting in the creation of common frames.

During this *Productive visit*, it is common for the designer to visit the manufacturer's workshop, taking advantage of the availability of materials samples and assembly details. However, sometimes

Figure 5.
Map of the process of collaboration on the productive visit.



these meetings may occur at the location where the furniture will be placed. Typically, these meetings revolve around the technical drawings, which serve as an essential tool for explaining and comprehending the product. At this stage, both parties are already familiar with the product, so the focus shifts toward discussing technical solutions and details. This negotiation process involves the creation of frames to facilitate effective decision-making and knowledge integration. Frames help structure the discussion by defining the problem (Kleinsmann, 2012).

Technical drawings play a crucial role in various stages of the collaboration, including the quotation phase, the *Productive visit* and the *Fabrication process*. Specifically, during the productive phase, there is an exchange of ideas between designers and manufacturers, with technical drawings serving as intermediaries of these discussions. They serve as a way to standardize communication, yet they have limitations, as they may not explicitly convey all critical information. Adereasen *et al.* (2015) suggest that verbal explanations often complement visual information in addressing this limitation.

Another important consideration for understanding these meetings is that knowledge creation in crafts often relies on experimentation and learning by doing. Therefore, during these meetings, designers can acquire tacit knowledge through collaborative experience (Temeltas and Kaya, 2021). However, it is crucial to align the explicit knowledge between the actors and to be systematically communicated.

9.2 Existing Tools for Strengthening Collaboration

Analyzing existing tools helped to identify specific aspects within each tool that contribute to improving collaboration. Emphasis was placed on tools that aid in creating shared understanding and facilitating the decision-making and negotiation process within teams. The scheme (figure 6) divided the tools into three categories associated with the challenges found in the collaboration between design studios and furniture producers, namely lack of experience together, lack of respect for each other's work, and lack of trust in each other's

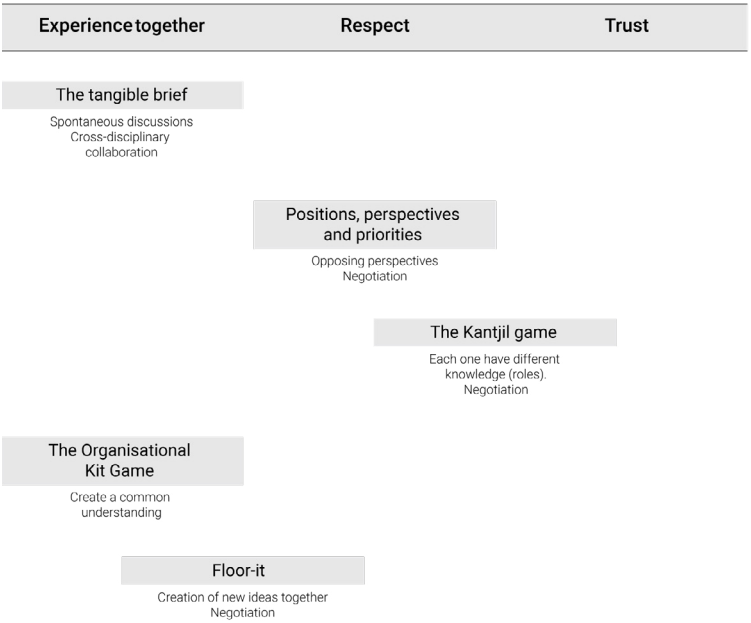


Figure 6. Categorization of the tools according with challenges in collaboration.

knowledge. These divisions allowed for the recognition of the specific aspects each tool focuses on.

The tools that place a central focus on the experience of working together promote collaboration through the development of common shared understanding and the generation of new ideas together. To ensure respect for each other's work, the employed strategies involve negotiation and understanding of diverse perspectives on the same problem. Moreover, in cultivating trust in each other's capabilities, the emphasis is on being confident in the knowledge of the other party to achieve common objectives.

9.3 Final Remarks

Throughout this chapter, a comprehensive understanding of the design situation in Uruguay has been gained, particularly regarding the dynamics of collaboration between designers and carpenters in furniture production. It becomes evident that *Productive visit* is a crucial step for creating shared understanding and knowledge integration, serving as the moment when design studios and manufacturing companies share their ideas and define the project details.

Moreover, considering a further intervention in this phase of the process, several considerations emerged from the analysis of existing tools: Regarding the experience working together, the tool should promote the creation of shared understanding by aligning the knowledge of the participants. To foster respect between them, the tool should propose negotiation to arrive at new ideas that align with the expectative and requirements of both actors. To build trust, the tool should encourage negotiation and showcase capabilities so decisions can be made collaboratively.

PART 3

Intervening in Context: Strengthening Collaboration

10. Design Requirements for Building Bridges

As observed in the second part, a crucial step in the collaboration is the productive visit, when design studios and manufacturers meet to define the project details. This phase is particularly important as both parties highlighted some challenges, including a lack of experience working together, respect for each other's process, and the necessity to cultivate trust in each other's work processes.

Aiming to propose an intervention to address these challenges, a tool is proposed to strengthen the collaboration between designers and manufacturers. The productive visit serves two primary objectives: ensuring that manufacturers comprehend the product and defining the product in a feasible manner.

To develop a tool for strengthening collaboration, several requirements were established to guide the process. These requirements are classified into three main areas: general expectations of the tool, characteristics of the tool itself, and specific features related to the form and functionality (table 5).

The first category of requirements is centered around the general aspects of the tool. It should provide structure to the meeting,

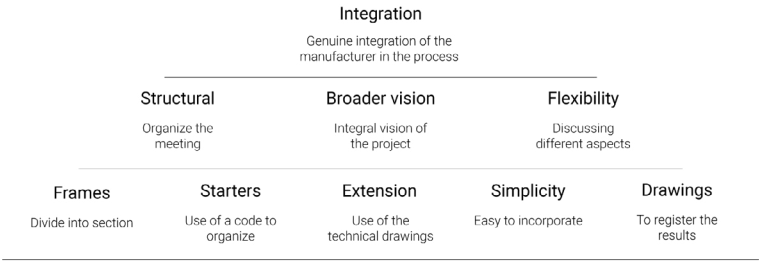
facilitate the integration of the manufacturer into the decision-making process, offer a broader perspective of the entire project, and possess the flexibility to support discussions on various aspects of the project. Those characteristics were derived from insights gained from interviews and aim to address the challenges faced in collaboration, such as the lack of manufacturer involvement in the process, changes in production dynamics, and the need for more comprehensive project information.

The second category pertains to the tool's intrinsic qualities. It should be easy to understand and not require much additional effort, ensuring a smooth adoption as a valuable asset in the collaboration. Furthermore, the tool should serve as an extension of the technical drawings, making optimal use of the materials available during the meeting to enhance their utility. This category also emphasizes breaking down the discussion into smaller, manageable frames. This approach simplifies the discussion of topics and avoids disrupting existing productive structures, aligning to the concept of framing to facilitate effective decision-making and integrate the knowledge.

Table 5.
Requirements.

Requirements	
General	
Structural Provide a structure or framework for conducting the meeting.	Integration Involve the manufacturer in the decision-making process and support discussions.
Broader vision Promote an integral vision of various aspects of the project.	Flexibility Be open to discussing different aspects of the project.
Tool-specific	
Simplicity Be easily understandable form the first interaction.	Frames Divide explanations and discussion into distinct sections for precision.
Extension Serve as an extension of the technical drawings.	Adaptation Be adaptable to different work platforms, where digital or on paper.
Form and function	
Starters Include elements that invite spontaneous discussion.	Drawings Encourage the use of drawings to bridge language barriers.
Aligners Help to maintain discussion focus on specific problems or objectives.	Visual codes Implement a code system to classify the topic being discussed.

Figure 7.
Organization of requirements.



Even though the meetings currently involve printed technical drawings in a physical presence, it is worth exploring the possibility of digitizing the meeting or adopting a hybrid approach that combines both paper and digital elements. Although this requirement is not explored now – since previous steps need to be taken before digitalization – future exploration can expand the capabilities of the tool and offer more flexible options of collaboration.

The final category focuses on specific attributes of the tool. It suggests the incorporation of starters, which are elements that promote the discussion, and a visual code for easy recognition of discussion topics and problem types. Additionally, it recommends the use of aligners or keywords to define the topic and maintain focus on one problem at the time. Lastly, the tool should be flexible in terms of the outputs of the meeting, allowing for both written and drawn representations. This approach is inspired by the analysis of various tools, as drawings can bridge language barriers and facilitate expression ideas.

All these considerations are instrumental in the development of the tool, with the primary goal of promoting genuine integration between design studios and manufacturing companies during the productive visits. This can be achieved by structuring the meeting, fostering an integral vision of the project, and facilitating discussion on various aspects of the projects. To accomplish this, frames are utilized to divide sections, a code is employed to organize topics, technical drawings act as an extension of the tool, and the system is designed to be flexible in the registration of the results, while also being simple to incorporate (figure 7).

11. En(Co): A Proposal for Enabling the Catalyzing Potential of Collaboration in Uruguay

Once the dynamics between designers and manufacturers in Uruguay were understood, a tool was developed to strengthen collaborative practices during productive visits, when technical details are defined. This tool aimed to structure the meeting, encourage participation from both parties, offer a comprehensive vision of the project, and facilitate discussions on diverse topics while addressing challenges in adopting innovative solutions for this sector.

11.1 Enclosing Collaboration

Enclosing Collaboration (EnCo) is a tool designed to strengthen collaborative practices between design studios and manufacturing companies during the productive visit, during which both parties discuss and define project details while aligning their mental models. The aim of this tool is to facilitate the decision-making process by supporting knowledge integration through the encouragement of knowledge sharing (i.e. prompting meaningful conversation about technical details).

METHOD WORKSHEET

Enclosing Collaboration - EnCo

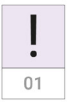
Once the product is ready to produce, it is time to share the drawings and start to define details.

You identified what to highlight and discuss during the productive meeting, and this will guide the conversation. Remember that technical drawings may need additional explanations to clarify critical points.

The aim is to co-create innovative and feasible solutions in a rapid and organise way. So it enables to quickly move through various points and establish shared understanding.

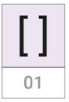
How to use it

Use the technical drawings of the project to identify critical points, which are divided into three distinct categories:



Be careful !
Fixed Parts: There are aspects that serves as constraints for the project and must remain unchanged.

What can be done ?
Discussion Points: Identify areas that require in-depth discussion and collaborative solutions.



[As you prefer]
Delegated Decisions: Pinpoints parts that can be delegated to the other party for decision-making.

During the meeting, these codes will serve as conversation starters to guide the discussion. As each topic is discussed, record the collective conclusions for each point in the worksheet, either through written notes or drawings, to document the conversation effectively.

What Next?

After the meeting concludes, the information gathered in the worksheet should be shared among the participants. The decisions made and the data discussed during the meeting serve as valuable information for the manufacturing of the product.

COLLABORATIVE DESIGN INTRODUCTORY PAGE

Figure 8.
Explanation of the tool.

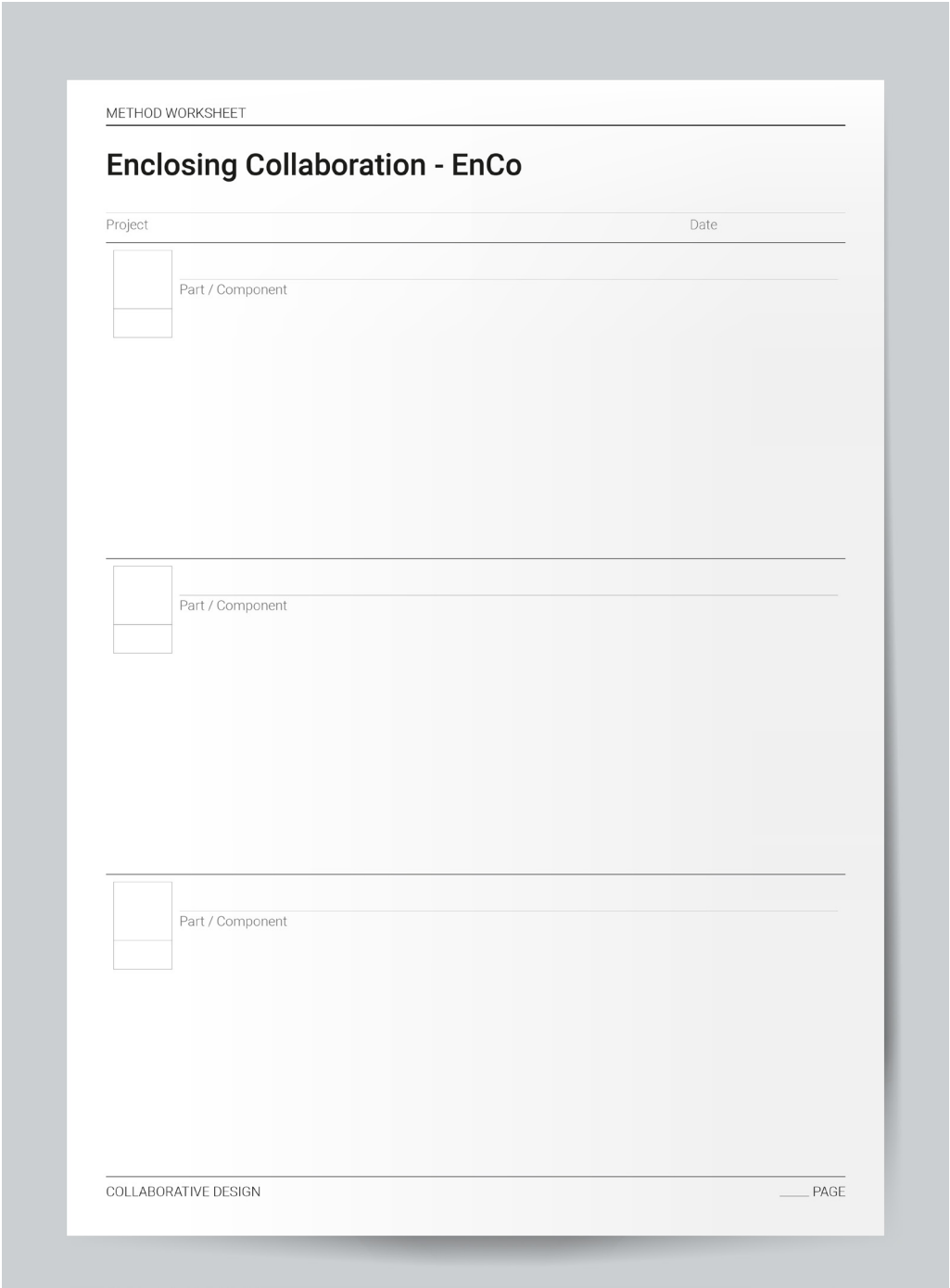


Figure 9.
Registration of the results.

The specific context in which EnCo is designed for is the collaborative interaction between two parties: design studios and furniture producers in Uruguay. The tool is used by designers during the preparation of the *productive visit*, where it complements the technical drawings by defining and classifying the aspects to be discussed. During the meeting, the tool guides the discussion by creating frames that break problems into manageable points. Moreover, the points are divided into three categories: fixed parts, discussion points, and delegated decisions. It helps to structure the meeting through a flexible methodology that integrates opinions and provides a broader perspective of the project.

This paper-based tool consists of two distinct parts: the first page that explains how to use the tool (figure 8) and a second page to record the results of the meeting (figure 9). The last page can be printed in the necessary number of copies.

11.2 Sequence of Use of EnCo

The sequence of use is organized into three stages (figure 10):

- *Planning*: this initial stage involves the analysis of technical drawings before the meeting. It is ideally done prior to the meeting to allow the design studio to identify and categorize potential issues. Creating frames, as suggested by Kleinsmann (2012), is a useful practice to enclose problems and assign names to important elements that need explicit attention. It is proposed for implementation by the design studios due to their experience working with this type of tool. Nevertheless, manufacturers can also adopt it.
- *Discussing*: this phase takes place during the productive meeting and centers about the critical points previously identified in the technical drawings. The meeting involves exploring issues, developing solutions, and questioning decisions. It is a process of moving and reflection aimed at knowledge integration (Kleinsmann, 2012). In line with the findings of Temeltas and Kaya (2021), artisans possess the ability and the flexibility to identify productive solutions efficiently. Therefore,

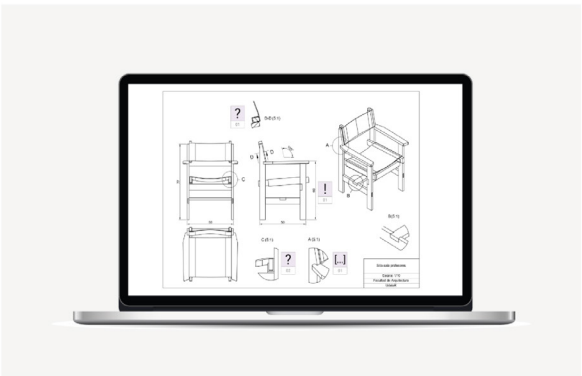
collaborative knowledge integration and solution exploration are crucial.

- *Results*: this is the final stage of the process but should be conducted after discussing each problem. It is the most effort-intensive step, as it requires explicitly outlining the solutions and agreements between both parties on how to proceed. This is a pivotal step, underlining the importance of making it as seamless as possible. The use of drawing-based communication is proposed to complement verbal communication and simplify the process.

Figure 10a. Storyboard (the chair used in the examples was designed by the Instituto de Diseño - FADU).

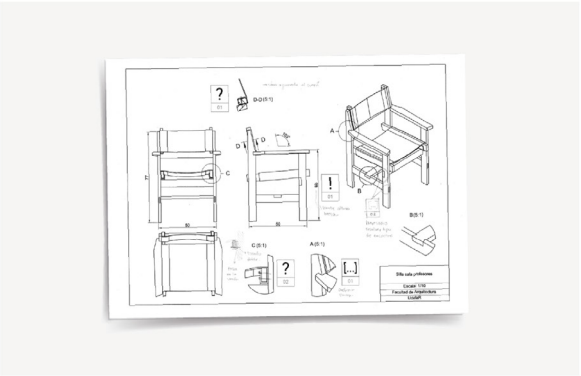
Before the meeting

01. Identify the aspect to discuss.



02. Assign a category to each point for discussion and a number to organize from general to specific.

03. Complete the worksheet with the information of the project.



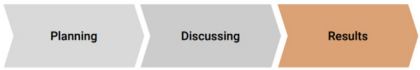
04. Using the technical drawings each point is discussed. Others icons can be added if necessary.

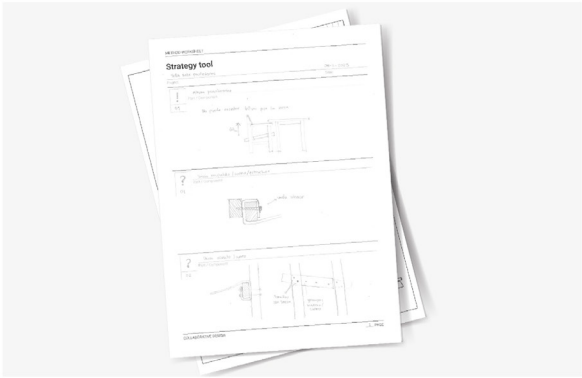
Figure 10b.
Storyboard (the chair used in the examples was designed by the Instituto de Diseño - FADU).

11.3 Code System

A code consisting of three signs has been developed to provide improved organization of the elements to be discussed (figure 11). These signs were designed to meet two primary requirements: simplicity to ensure that anyone can confidently draw them by hand if necessary, and the ability to complement verbal communication by visually highlighting points of emphasis. Each sign corresponds to a specific approach to a crucial point:

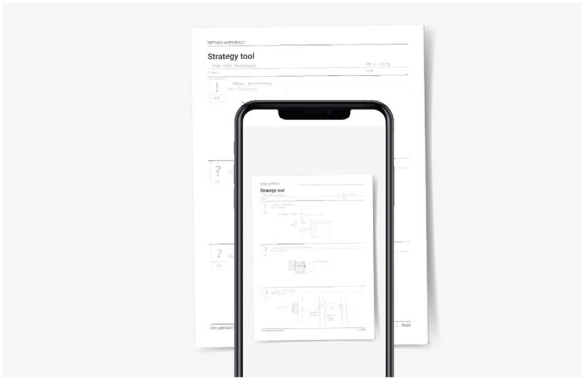
Figure 10c. Storyboard (the chair used in the examples was designed by the Instituto de Diseño - FADU).





05. After each point discussed, document the decision made in the worksheet.

After the meeting



06. When all the points are discussed, share the document with the resolutions.

- *Fixed parts*: this represents aspects of the project that are constraints and must remain unchanged. It is denoted by an exclamation mark, signifying the need to exercise caution and respect the set limits. These critical elements are sometimes overlooked in explanations but play a vital role in providing an overall view of the project, as was noted in the collaborative challenges.
- *Discussion points*: this represents areas requiring in-depth discussion to arrive at collaborative solutions. They are indi-

cated by a question mark, signifying the need for dialogue to address the question: *What can be done?* discussing those points is essential during the meeting to reach mutually agreeable, feasible solutions.

- *Delegated decisions*: This denotes aspects that can be left to the other party for decision-making. They are not intended for in-depth discussion during the meeting. Instead, they invite the other party to make their preferred choice. They are presented as a type of brackets, indicating that they contain more detail but can be developed by the other part.

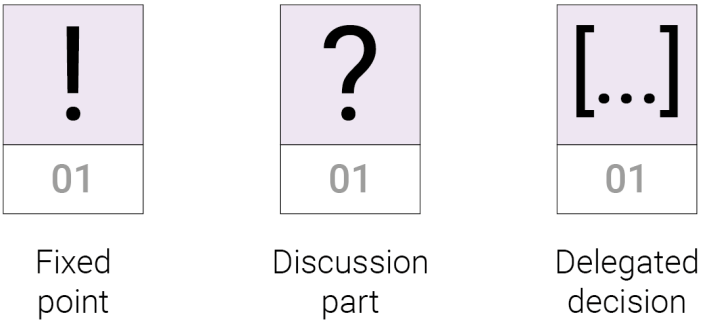


Figure 11.
Signs to categorize the aspects to discuss.

The tool is paper-based, consistent with how both parts currently work during the productive visits. Designers bring printed technical drawings to the meeting, and this new tool is seamlessly incorporated to this format. Typically, standard printers are used to produce A4-sized, colorless documents. The tool's document comprises two main sections: one for guidance on its usage and another for recording results.

Regarding the incorporation of these signs in the technical drawings, three alternative methods have been explored to offer flexibility:

- *digital format*: the signs are digitally incorporated before printing the documents, where they can be added as a block using drawing software;
- *drawing by hand*: the simplicity of the signs enables anyone to add them at various points, even during the meeting if necessary. This alternative provides the most flexibility as it does not require any additional elements;

- *added mark*: another option is to use stickers or a seal to apply the signs, making the process more practical and clear.

These diverse incorporation methods are presented to ensure that the tool remains flexible, as its intent is not to have a rigid but adaptable to various situations.

11.4 The Design Solution

The tool was designed to address specific challenges identified during the research, such as the lack of experience working together, the lack of respect for each other's work, and trust in each other's work.

To improve the experience working together, the tool proposes the creation of frames to align knowledge on different aspects of the project, not only on topics requiring in-depth discussion. Additionally, the tool promotes discussion and negotiation, allowing both parties to acquire knowledge from each other that can be applied to future projects.

To foster respect, the tool aims to gain a broader vision of the project by using categorization, ensuring everyone understands the nature of the aspect to be discussed and their role in the project.

To build trust, the tool encourages spaces for discussing topics in a way that is familiar to both parties, with technical drawings playing a central role in bridging communication barriers. This ensures that both actors feel comfortable with the way discussions are conducted.

12. Collecting Local Perspectives on EnCo

The primary aim of this case study was to strengthen the collaboration between designers and manufacturing companies by developing a tool to align common understanding and reinforce collaborative practices. After development of EnCo, the tool was validated through interviews to gather insights and opinions from the involved actors, and its performance was discussed alongside research findings.

12.1 Validation of the Tool

The tool was validated through interviews with both involved parties, Carlo Nicola representing the design studios and Pablo Ferrer and Heber Coitinhio representing the carpenters, enabling meaningful feedback on the tool and its potential implementation. Initial impressions of the tool were positive from both perspectives. Participants noted that, despite typically seeking order in the meetings, this tool helped develop discussions in a more organized and effective manner.

12.1.1 Feedback: general requirements

To gain more in-depth feedback, opinions were sought of the initially defined requirements of the tool. This aimed to provide a more precise validation of whether the tool was meeting its objectives.

- *Simple to understand from the first interaction*: answers were positives. Nicola, representing the designers, added that the tool is easy to integrate into their routine as it enhances an activity that they regularly perform. Carpenters also found the tool simple, quickly understanding its dynamic of use.
- *Flexibility to discuss different topics*: all interviewees agreed on the tool's versatility in covering various aspects of the project. Ferrer, from Zona M, mentioned its potential use for different project types and suggested the tool's expansion during the interview.
- *Integral vision of the project*: concerning the broader vision of the product, producers expressed interest. Coitinho, from Mundomadera, highlighted the tool's value in not only identifying points for discussion but also recognizing aspects that must remain unchanged.
- *Integration of both parts on the discussion*: Nicola noted that integration is standard in all their projects. Therefore, the discussions about project details result in an important step, as the acquired knowledge is applied in subsequent projects.

12.1.2 Organization of the productive visit

To better organize the meeting, the aspects to discuss have been dividing into three categories:

- *Fixed parts*: aspects that must remain unchanged;
- *Discussion points*: areas that require an in-deep discussion;
- *Delegated decision*: aspects that can be left on the other part for the decision.

Regarding this division into categories, all agreed on the fact that all possible situations are covered in them. When symbols for each category were explained to carpenters, they quickly grasped their meaning and started using them during conversations. Ferrer suggested an order for discussing categories during the meeting, emphasizing unchanged aspects at the beginning to understand

project limitations, progressing from the most general topics to the most specific topics.

12.1.3 Usability of the tool

Concerning usability, Nicola emphasized the clarity of the rules from the beginning. For both carpenters, the tool's most useful aspect was having a guide for the meeting, ensuring all points were discussed.

However, some aspects were considered challenging to implement. Nicola underscored two points. Firstly, there are instances where they lack the time for in-person meetings, leading to the loss of the meeting information. Secondly, he noted concerns about the documentation of the meeting results. Although it is crucial for the production phase, it has the potential to slow down the meeting. On the other hand, Coitinho faced challenges related to having the guide before the meeting, as it contributes to understanding the project and making it more effective. Pablo expressed difficulties associated with sharing information after the meeting.

12.1.4 Improvement opportunities

Improvement opportunities were identified aiming to improve the usability of the tool. Firstly, according to the carpenters, the list of discussion points for the meeting can be proposed by both parties, not just the designers, to ensure a more collaborative meeting.

Moreover, it would be beneficial to have a method to share the results after the meeting, allowing for ongoing exchange between the parts. For example, a platform could be used to share the results and engage in short conversations about the tasks after the meeting.

12.2 Strengthening the Collaboration

During the research process, and specifically in the design of the tool, the focus has been on proposing a tool adapted to the specific challenges in the collaboration between manufacturing companies and design studios in Uruguay. Consequently, strategies were implemented to strengthen collaboration between design studios and furniture producers during the productive visits, with specific goals aimed at

conducting structured meetings, integrating the opinions of both parties, providing a comprehensive vision of the project, and fostering flexibility in discussing diverse topics.

The tool's structured meeting format facilitates the creation of frames, a concept derived from Kleinsmann (2012), which helps encapsulate problems and solutions, guiding actions for effective decision making. Consequently, the tool breaks down the project into manageable points, enabling focused problem-solving without disrupting the work-flow dynamics of the producer.

Integrating the distinct visions of designers and producers is inherently challenging due to differing expectations, requirements, and project knowledge. Through the examination of various tools, negotiation emerges as a fundamental aspect supporting interaction and the creation of shared meaning. The tool addresses concerns voiced by carpenters during interviews regarding their limited participation in decision-making process. It proposes a framework that accommodates both parties, utilizing familiar elements such as paper-based documentations, technical drawings as communication bridge, and discussions centered on the producer's field of expertise.

Producer emphasis on having a broader vision of the product is considered critical for enhancing collaboration and improving the production process. Integrating knowledge between actors ensures awareness of different project aspects, contributing to a more effective production process. The categorization into three sections not only facilitates discussion of unresolved points but also enables the sharing of valuable information about the project limitations.

The tool suggests a flexible methodology to address various project aspects, with categories linked to the type of problem for discussion rather than the specific problem itself. This ensures that all problems can be addressed within a designated category. The focus of meeting structuration is to cover all discussion points while remaining flexible in addressing the unique nature of each problem.

With these key features focused on strengthening collaboration between design studios and manufacturing companies, the tool aims to minimize the gap identified during this research. By offering a solution that helps overcome collaborative barriers, it seeks to build a shared understanding between both actors.

Another critical consideration is the tool implementation, which should not require additional effort from either part. Its effectiveness lies in its adaptability to existing work dynamics, using familiar elements such as technical drawings as a mediator, paper-based documents, and focusing discussions on the producer's domain.

12.2.1 Limitations

One of the limitations of the research is that the tool has been tested with one particular type of producer – carpentries with a technical office. While this study provides valuable insights, there is a potential for expansion through a quantitative perspective to enhance comprehensiveness and generalizability. Despite its specificity, this effort represents an initial step in the broader goal of strengthening collaboration in the manufacturing sector in Uruguay.

12.2.2 Further improvements

As mentioned earlier, the design and testing of the tool involved only one type of manufacturing company in Uruguay. Therefore, further improvements can include more systematic data gathering and analysis to extend the tool's applicability to a broader range of producers.

Specifically, regarding the proposed tool, there is room for further enhancements in its digitalization, as suggested by insights from interviews with Carlo Nicola and Pablo Ferrer. While a paper-based tool appears most suitable for the context, various options for a digital tool can be analyzed. Moreover, digitalization can support exchange post-meeting, allowing documents to be shared and facilitating communication between designers and producers.

PART 4

Generalizing EnCo: Scalability and Future Perspectives

13. Scalability and Adaptation of EnCo

In the previous section, a tool was developed to strengthen the collaboration between design studios and carpenters in response to the challenges identified in their working relationship. EnCo was created to structure productive visits – when both actors define the project's details – facilitate decision-making, and encourage knowledge integration. This chapter now shifts focus to explore the potential of EnCo to be adapted and implemented beyond its original context.

This tool was intentionally designed to be simple and flexible, allowing it to be easily adapted to diverse settings to support collaborative practices. Although EnCo was developed for a specific case – the Uruguayan furniture sector – the challenges it addresses are shared by many other regions and productive sectors. Therefore, this chapter evaluates the universal and contextual components of the tool that contribute to its scalability and adaptability across different geographic areas and industries. Furthermore, it examines the limitations and enabling conditions for its successful implementation.

13.1 Universal Components vs. Contextual Components

The development of EnCo was guided by interviews conducted with design studios and furniture producers in Uruguay, as well as by an analysis of the broader regional context and collaboration dynamics. To better understand the nature and potential of the tool, it is essential to distinguish between what can be directly applied elsewhere and what may require adaptation.

This distinction between universal and contextual components is key to evaluating the scalability of EnCo. Universal components refer to elements that can be transferred to other contexts with little or no modification, while contextual components are specific to the Uruguayan reality and may require adjustment in different settings.

The universal components of EnCo are primarily related to its structure and methodology. These include:

- the framing of discussions to organize meetings effectively;
- the categorization of issues (e.g., fixed, discussion, and delegated decisions);
- the use of visual mediators (such as technical drawings);
- a step-by-step format that guides the decision-making process;
- an emphasis on fostering participation from both parties.

These elements are grounded in collaborative design practices and aim to strengthen mutual understanding and cooperation between stakeholders, making them adaptable to many different contexts.

On the other hand, contextual components can be grouped into two categories: the purpose of the tool, which is shaped by cultural and historical backgrounds, and the project context, which reflects specific characteristics of the local production environment.

The purpose of the tool aligns with local features of collaboration in Uruguay, such as small-scale, artisanal or semi-industrial production, limited experience in collaborative design, and informal or trust-based working relationships. These realities informed EnCo's focus on supporting collaboration during critical phases (such as *productive visits*), fostering transparency and mutual respect, and reducing ambiguity in decision-making.

The project context is more directly tied to practical aspects of the Uruguayan setting – such as limited resources, the necessity of in-person collaboration, and the absence of digital workflows. These characteristics are reflected in the tool's simplicity, paper-based format, and flexibility, which make it easy to use and adapt during on-site interactions.

By identifying and separating these universal and contextual elements, EnCo becomes more than a tool designed for a single setting – it becomes a framework that can be adapted rather than replicated, ensuring its relevance across diverse environments. For instance, contextual elements such as the paper-based format can be reimagined for more digitalized workflows, without losing the core collaborative principles that define EnCo.

13.2 Adaptability to Other Productive Sectors

EnCo was developed as a specific solution to support collaboration between design studios and furniture producers. However, it is also a flexible tool, not a closed solution, and can be adapted to other productive sectors.

As previously discussed, certain features of EnCo are closely linked to the specific context of Uruguayan furniture production such as small-scale and artisanal production, the need for close collaboration between designers and producers, and a lack of mutual trust. These characteristics are not exclusive to carpentry. Other sectors, such as iron or upholster workshops that also contribute to furniture production, share similar dynamics. Beyond furniture, EnCo could be adapted to other crafts-based sectors such as ceramic, glass or textile workshops.

An easy adaptation can be envisioned in contexts where workshops have flexible production structures, where each project has its own particularities, and where maximizing collaboration allows each part to contribute with their knowledge and past experiences. Common practices in these settings – like using drawings to communicate project ideas and requiring direct interaction to define product characteristics – are aligned with the principles of EnCo.

EnCo could also be adapted to sectors with different characteristics, including a more digitalized or industrialized environment. In these cases, the universal components of the tool become key –such as strengthening collaboration during the project presentation in multidisciplinary teams, framing and organizing discussions, categorizing topics to address, and encouraging the participation of all parties involved.

In conclusion, EnCo has the potential to be adapted to broader contexts, including collaborations between design studios with other productive sectors – whether artisanal or more industrialized. While adaptations would be required, the flexible structure of the tool makes it possible to continue exploring its application in new scenarios.

13.3 Digitalization and Artificial Intelligence in EnCo

The main challenges in adapting EnCo to more digitalized or industrialized contexts lies in its digitalization, integration with other tools like technical drawing, and the overall framework in which it is used. Some potential strategies for adaptation include implementing a digital format that integrates with management or collaborative software, or combining it with drawing tools so it can be easily embedded into existing workflows. A digital version of EnCo could support both the meeting itself and exchange post-meeting.

The recent increase in the use of Artificial Intelligence (AI) and its application in the design process presents new opportunities to enhance the usability of EnCo. In this emerging scenario, it is relevant to analyze how the design process is increasingly intertwined with AI.

An analysis of integration of AI into EnCo must maintain these contextual parameters as one of the main objectives of this research was to analyze the Uruguayan and develop a tool that responds to its specific challenges. The main strength of EnCo lies in supporting collaboration through dialogue and negotiation, valuing the knowledge and perspectives of both parties. It is essential to preserve this human-centered approach when considering technological enhancements.

In line with this, potential ways to integrate AI into EnCo could include:

- digitalization of the tool, facilitating real-time visualization and automatic updates of decisions made;
- supporting decision-making by suggesting options based on previous experiences;
- tracking post-meeting agreements and tasks;
- embedding the tool into collaborative digital platforms, where AI can act as a mediator assistant for both parts.

Although the use of AI in the context of EnCo may still seem distant, as observed, the presence of AI-based tools in the design process is rapidly increasing. Anticipating this phenomenon and exploring its implementation in specific Global South contexts is essential for a contextualized and equitable technological development. Therefore, continuing to explore these types of alternatives can support future integration.

13.4 Scalability in a Broader Context

EnCo is a tool specifically developed by analysing the Uruguayan context. However, its adaptation to other realities is entirely possible. In fact, scaling the tool to other countries in the region presents an opportunity to strengthen the collaboration between local industry and designers.

As discussed throughout this book, there are notable similarities between the development of Design in Uruguay and in other parts of Latin America. One key similarity is the historical and ongoing relationship between Design and industry. The economic, social and political processes that shaped Latin America have influenced the (non-) industrialization of many countries in the region. Shared characteristics include the distance between the scientific/academic sector and the industry, the prevalence of small-scale production often linked to craftsmanship, and a design practice that seeks to reconnect with local traditions.

These conditions are complemented today by emerging design trends that advocate for autonomy, decolonization, and collaboration

with the craft-based practices, creating spaces that foster diverse perspectives and collective learning.

The challenges identified in Uruguay, such as the lack of experience working together, disconnection, and lack of trust between design studios and manufacturers, can also be observed in other Latina American countries. These commonalities – such as small-scale, artisanal production and weak collaborative structures – make it possible to envision the scalability of EnCo throughout the region.

EnCo can serve as a tool to reinforce local practices and promote co-creation, helping to avoid the imposition of external standards that may not align with local realities or support plural perspectives. The key to its scalability lies in its simplicity and flexibility, which allow it to be easily adapted to the cultural, technological and productive specificities of each context.

13.5 Limits and Conditions for Scalability

Even though EnCo is a tool that can be adapted to support collaboration between designers and various productive sectors, as well as different countries in the region, there are certain limits and conditions that influence its implementation.

One important condition for successful implementation is a shared openness to collaboration. Both parties must be willing to engage in dialogue and teamwork, and they need to recognize and value each other's knowledge and contributions. Additionally, direct interaction between the actors is essential – whether through in-person or virtual meetings – where both sides are available and willing to participate in discussion. Another key factor is complementary skills, where each party brings distinct expertise to the table.

On the other hand, some factors may limit EnCo's implementation. These include the lack of prior experience in collaborative work or a lack of trust due to past experiences. Highly structured or automated production processes may also pose a challenge, as they offer less room for adaptation or innovation. Lastly, limited time and resources dedicated to exchange and collaboration can also hinder the effective use of the tool.

This chapter explored the different layers of EnCo to reveal its flexibility and potential for scalability. By analysing the tool's characteristics, it becomes clear that some components are more easily transferable to broader contexts than others. The universal elements – such as the structuring of discussions, the categorization of the topics, and the encouragement of mutual participation – are related to its methodology and can be potentially adopted in other countries with similar challenges or in different productive sectors. In contrast, the contextual elements – such as the paper-based format or the emphasis on in-person interaction – are specific to the Uruguayan context and may require adaptation in other settings.

Although adjustments are necessary for the tool's scalability, EnCo's open and flexible structure enables its adaptation to different production environments, including more digitalized or industrialized context. This flexibility positions EnCo not as a fixed solution but as a dynamic framework that can evolve in response to diverse needs.

Ultimately, EnCo invites further explorations and developments. Its adaptable nature offers a foundation for future research and experimentation, supporting the creation of new strategies to strengthen the collaboration between designers and producers in a variety of local and international contexts.

Conclusions

The research focused on understanding the relationship between design studios and furniture manufacturers in Uruguay, aiming to explore the dynamics between design and industry and devise strategies to strengthen their collaboration. By comprehending the design landscape in Uruguay and conducting interviews with both designers and manufacturers, valuable insights were gained about the challenges in their collaboration. This groundwork led to the development and testing of a tool to strengthen the collaboration during the production phase.

The tool was specifically designed for the *productive visits*, a critical phase where project details are defined. It aimed to provide structure to the meeting, integrate producers into the decision-making process, promote an integral vision of the project, support the discussion of various topics, and be simple to understand and implement. The tool addressed specific challenges such as the lack of experience working together, the lack of respect for each other's work, and trust in each other's work. It achieved this by creating frames to align knowledge on different aspects of the project, categorizing discussions

to understand the nature of the topics and roles in the project, and using familiar elements such as technical drawings or paper-based documents as mediators.

Through the development of this research, which culminated in the design of a collaborative tool, it is possible to observe design from multiple perspectives, as every design proposal inherently positions design within a specific approach. The tool represents an initial step in reinforcing collaborative practices and bridging the gap between designers and manufacturing companies in Uruguay – a divide evident in various facets of the research.

This project, which materializes in a tool, examines the design practice from three main points of view. Firstly, it considers the broader context of design development in Latin America, particularly in Uruguay, to understand the global relationship between Design and industry within this region. Secondly, it focuses on the specific role of Design in furniture production and the unique challenges faced by design studios in Uruguay. Lastly, it positions Design within a collaborative framework, addressing how the process and the interaction between designers and manufacturers should unfold. The design proposal is situated in the intersection of all these aspects.

The development of Design within Latin America has been a complex process, shaped by various social, political, and economics factors. While Design was initially seen as a tool for development, it did not evolve as expected, resulting in a disconnect between industry and academia. Understanding the geopolitical context and the development of Design provides insights into how to create solutions that are not merely copied from central countries but are tailored for local realities. For this particular project, a deeper understanding of local design helped identify the origin of challenges between designers and manufacturing companies, enabling the proposal of solutions that were well-adapted to both parties. EnCo focuses on providing strategies that align with the specific manufacturing realities of Uruguay, using familiar elements and avoiding reliance on approaches suited for different industrial contexts.

While the initial focus was on understanding the global context of Design in Latin America and Uruguay, it also delved into design at a more localized level. Through a series of interviews with both de-

signers and manufacturers, the project explored the specific challenges they faced. The particularities of the local industry, such as semi-artisanal production, provided crucial insights in the relationship between the two. This understanding ensured that the proposed solutions were suitable for the local reality, and EnCo was designed to address a challenging moment in the collaboration between designers and manufacturers, helping to overcome barriers.

Positioning Design within the interaction between local industry and design studios is a deliberate choice that frame Design in a traditional role, closely tied to industrial development. This focus led the exploration towards the furniture sector, an important area of physical production in Uruguay. The small scale, expert workforce, and flexibility in manufacturing within this sector influenced the dynamics of the NPD process. EnCo aims to enhance these characteristics by providing a tool that is adaptable to different project requirements while structuring the collaboration process.

Collaborative design theory, originating in central countries, often cannot be directly adapted in peripheral countries like Uruguay. Its successful implementation requires understand the unique characteristics of the local design landscape. Collaborative design fosters a framework where both manufacturers and designers contribute to the new product development. This approach helped to better understand the relationship between the two and guided the process toward inclusion, engagement, and stronger interaction. EnCo applies this collaborative framework by structuring the decision-making process, breaking down challenges into manageable steps, and integrating the different perspectives of the project to align expectations and requirements.

This research emphasizes the need to contextualize design practices in peripheral countries, advocating for relevant solutions that address local realities rather than adapting models from countries, which often fail to bridge the gap between Design and industry. The strength of the proposed tool lies in its ability to intersect various design approaches, making it particularly useful for Uruguay's context. Collaboration emerges as a core element of the design process, highlighting the importance of inclusion, engagement, and strengthened interaction between actors. The in-depth analysis and the

active participation of key stakeholders ensured the development of a solution that aligns with existing work dynamics and fosters effective collaboration between designers and manufacturers.

In conclusion, while a single tool may not solve all the challenges identified, this research offers a significant first step toward understanding the specificities of the Uruguayan context and proposing a solution to strengthen collaboration in the design and manufacturing sector.

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References

Andersen, P. V. K., & Mosleh, W. S. (2021). *Conflicts in co-design: Engaging with tangible artefacts in multi-stakeholder collaboration.* CoDesign, 17(4), 473-492. https://doi.org/10.1080/15710882.2020.1740279

Andreasen, M. M., Hansen, C. T., & Cash, P. (2015). *Staging Conceptualization.* In M. M. Andreasen, C. T. Hansen, & P. Cash, Conceptual Design (pp. 71-92). Springer International Publishing. https://doi.org/10.1007/978-3-319-19839-2_4

Becattini, G. (2002). *From Marshall's to the Italian "Industrial districts". A brief critical reconstruction*. In Complexity and industrial clusters (pp. 83-106). Physica-Verlag HD.

Belussi, F., & Sedita, S. R. (2019). *Innovation Districts*. In A. M. Orum (Ed.), The Wiley-Blackwell Encyclopedia of Urban and Regional Studies (Issue April, pp. 1-5). Wiley-Blackwell. https://doi.org/10.1002/9781118568446.eurs0162

Bonsiepe, G., Bistolfi, M., López López, J. M., García Rubio, O., & Gómez Abrams, J. (1985). *Artefacto: Revista de diseño industrial*. Año 1, n. 2, 1985. http://zaloamati.azc.uam.mx//handle/11191/9068

Bonsiepe, G. (2022). *The disobedience of design*. In L. Penin (Ed.). London: Bloomsbury Publishing.

Brandt, E. (2006). *Designing exploratory design games: A framework for participation in Participatory Design?* Proceedings of the Ninth Conference on Participatory Design: Expanding Boundaries in Design, Vol. 1, 57-66. https://doi.org/10.1145/1147261.1147271

Bucciarelli, L. L. (2002). *Between thought and object in engineering design*. Design Studies, 23(3), 219-231. https://doi.org/10.1016/S0142-694X(01)00035-7

Buitrago, J. C., & Braga, M. da C. (2014). *ALADI. Algunas hipótesis sobre su configuración (1980-1995)*. Nexus Comunicación. https://doi.org/10.25100/nc.v0i15.733

Cabrera, C. S. (2016). *Ética y modernidad en el discurso de Gui Bonsiepe*. http://unicornio.utadeo.edu.co/tesis/maestria_est_hist_arte/T032.pdf

Camuffo, A., & Grandinetti, R. (2011). *Italian Industrial Districts as Cognitive Systems: Are They Still Reproducible?* Entrepreneurship & Regional Development, 23(9-10), 815-852.

Carlile, P. R. (2002). *A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development*. Organization Science, 13(4), 442-455. https://doi.org/10.1287/orsc.13.4.442.2953

Cash, P., Dekoninck, E. A., & Ahmed-Kristensen, S. (2017). *Supporting the development of shared understanding in distributed design teams*. Journal of Engineering Design, 28(3), 147-170. https://doi.org/10.1080/09544828.2016.1274719

CDU & TNU (canal 5). (2011, September 15). *Uruguay Se Diseña* Interview in La noticia en su contexto. https://designuy.wordpress.com/2011/09/15/entrevista-a-cdu-en-la-noticia-y-su-contexto-tnu-canal-5/

CDU. (2020, December 7). *Se lanzó la Hoja de Ruta para el Diseño uruguayo*. CDU | Cámara De Diseño De Uruguay. https://cdu.org.uy/se-lanzo-la-hoja-de-ruta-para-el-diseno-uruguayo/

CDU. (2022, June 7). *Pro Diseño 2022*. CDU | Cámara De Diseño De Uruguay. https://cdu.org.uy/pro-diseno-2022/

CDU. (2024, May 22). *Sobre la CDU*. Retrieved June 3, 2024, from https://cdu.org.uy/sobre-la-cdu/

Chimento, F. (2023). *Diseño, realismo mágico y nuevas narrativas Latinoamericanas: Una mirada del Diseño de Producto en Argentina y Brasil*. Diseño Arte y Arquitectura, 14, 31-50. https://doi.org/10.33324/daya.vi14.648

Comaroff, J., and Comaroff, J. (2012). *Theory from the South: Or, how Europe is evolving toward Africa*. Anthropological Forum 22, n. 2: 113-131.

Conglomerado de Diseño. (2011, November 14). *Uruguay Se Diseña*. https://designuy.wordpress.com/conglomerado/

Devalle, V. (2021). *Diseño y artesanía en América Latina. Imágenes en tensión entre lo dominante, lo residual y lo emergente. Cuadernos Del Centro de Estudios En Diseño y Comunicación*. Ensayos, 96, 19-28. https://doi.org/10.18682/cdc.vi96.3924

Escobar, A. (2018). *Autonomous design and the emergent transnational critical design studies field*. Strategic Design Research Journal, 11(2). https://doi.org/10.4013/sdrj.2018.112.10

Fernández, S. (2006). *The Origins of Design Education in Latin America: From the hfg in Ulm to Globalization*.

Fernández, S., & Bonsiepe, G. (2008). *Historia del Diseño en América Latina y el Caribe*. Sao Paulo: Blücher.

Fernández Uriarte, L., & Pujol Bonani, S. (2021). *Para qué y por qué se diseña.* ALCANCE Revista Cubana De Información Y Comunicación, 10(27), pp. 139-153.

Fogale, M. (2021). *Hilos invisibles: Un workshop creativo inspirado en Julio Vilamajó*. Revista De La Facultad De Arquitectura, Diseño Y Urbanismo, (16), 170-174. https://revistas.udelar.edu.uy/OJS/index.php/RFADU/article/view/346

Gay, A., & Samar, L. (2007). *El diseño industrial en la historia*. (2nd ed.). Cordoba: teC.

Hausmann, R., Hidalgo, C. A., Bustos, S., Coscia, M., & Simoes, A. (2014). *The atlas of economic complexity: Mapping paths to prosperity*. Cambridge,Massachusetts: MIT Press.

Hernández, E., Reyes, C., Usher, X. (2021). *Encuesta de actividades de innovación en la industria manufacturera y servicios seleccionados (2016-2018). Principales resultados*. Colección Indicadores y Estudios n.10. Montevideo: Agencia Nacional de Investigación e Innovación.

Hidalgo, C. A., & Hausmann, R. (2009). *The building blocks of economic complexity. Proceedings of the National Academy of Sciences of the United States of America*, 106(26), 10570-10575. https://doi.org/10.1073/pnas.0900943106

IDEO. (n.d.). *DESIGN KIT*. Retrieved September 23, 2023. https://www.designkit.org

Islind, A. S., Lindroth, T., Lundin, J., & Steineck, G. (2019). *Co-designing a digital platform with boundary objects: Bringing together heterogeneous users in healthcare*. Health and Technology, 9(4), 425-438.https://doi.org/10.1007/s12553-019-00332-5

Kleinsmann, M.S., Buijs, J., & Valkenburg, R. (2010). U*nderstanding the complexity of knowledge integration in collaborative new product development teams: A case study.* Journal of Engineering and Technology Management, 27(1), 20-32. https://doi.org/10.1016/j.jengtecman.2010.03.003

Kleinsmann, M.S., Deken, F., Dong, A., & Lauche, K. (2012). *Development of design collaboration skills*. Journal of Engineering Design, 23(7), 485-506. https://doi.org/10.1080/09544828.2011.619499

Kleinsmann, M. S., (2006). *Understanding collaborative design*. https://repository.tudelft.nl/islandora/object/uuid%3A0a7a57d4-c846-4458-a59f-24c25acbafa9

Kleinsmann, MS., & van der Lugt, R. (2007). *Design games for simulating design communication*. In S.N. (Ed.), Proceedings of the 16th International Conference on Engineering Design, ICED'07 (pp. 1-13). École Central Paris.

Kleinsmann, M.S., Valkenburg, R., & Buijs, J. (2007). *Why do(n't) actors in collaborative design understand each other? An empirical study towards a better understanding of collaborative design*. CoDesign, 3(1), 59-73. https://doi.org/10.1080/15710880601170875

Kvan, T. (2000). *Collaborative design: what is it?* Automation in Construction, 9(4), 409-415. https://doi.org/10.1016/s0926-5805(99)00025-4

Lavin, M. C. (2019). *Craft and Design Partnerships in the Chilean Context. A Critical Perspective.* The Design Journal, 22(sup1), 967-979. https://doi.org/10.1080/14606925.2019.1595411

Le Dain, M.-A., Merminod, V., & Yager, M. (2020). *Collaborative practices in new product development projects involving suppliers.* Production Planning & Control, 31(4), 308-321. https://doi.org/10.1080/09537287.2019.1632500

Maffei, S., & Zurlo, F. (2000). *Designing as a competence: design process as the result of a "learning by interacting" practice. Evidence from Italy*. Working Papers in Art and Design, 1.

Ministerio De Industria, Energía Y Minería (MIEM). (n.d.). *Fondo Naranja*. https://www.gub.uy/ministerio-industria-energia-mineria/politicas-y-gestion/programas/fondo-naranja

Morales, L. R. (2015) *A critical review of design history: From the individual artist to the social agent*. Strategic Design Research Journal, 8(1):2-8 January-April 2015. Unisinos . Https://doi:10.4013/sdrj.2015.81.01

Morosini, P. (2004). *Industrial clusters, knowledge integration and performance*. World Development, 32(2), 305-326. https://doi.org/10.1016/j.worlddev.2002.12.001

Noel, L., Ruiz, A., Van Amstel, F. M., Udoewa, V., Verma, N., Botchway, N. K., Lodaya, A., & Agrawal, S. (2023). *Pluriversal futures for design education*. She Ji, 9(2), 179-196. https://doi.org/10.1016/j.sheji.2023.04.002

Ocampo, J. A. (2004). *La América Latina y la economía mundial en el largo siglo XX*. El trimestre económico, LXXI (4), 725-786.

Pastorino, J., Kimelman, N., & Castillo, A. (2021). *Las industrias creativas como agentes de innovación en Uruguay: Descubrí el poder del vínculo*. Inter-American Development Bank. https://doi.org/10.18235/0003836

Perks, H., Cooper, R., & Jones, C. (2005). *Characterizing the Role of Design in New Product Development: An Empirically Derived Taxonomy**. Journal of Product Innovation Management, 22(2), 111-127. https://doi.org/10.1111/j.0737-6782.2005.00109.x

Porter, M. E., & Kramer, M. R. (2011). *Creating shared value.* Harvard Business Review, 89(1-2). https://doi.org/10.32591/coas.ojss.0201.04037b

Richards, N. (2014). *Decolonizing globalization studies*. The Global South, 8(2), 139. https://doi.org/10.2979/globalsouth.8.2.139

Rosen, E. (2007). *The culture of collaboration*. San Francisco, California: Red Ape Pub.

Rosi, F. (2018.). *Diseño industrial para el desarrollo del país.* EN: Revista de la Facultad de Arquitectura, Diseño y Urbanismo, n. 16, pp. 104-111.

Salão Design Award. (n.d.). *The Brazilian Furniture Design Award*. Retrieved June 3, 2024. https://www.salaodesign.com.br/en/salao-design-award/

Salgado, M. (2022). *Diseño y territorios* (Rosemberg, Ed.).

Sanders, E. B.-N., & Stappers, P. J. (2008). *Co-creation and the new landscapes of design*. CoDesign, 4(1), 5-18. https://doi.org/10.1080/15710880701875068

Schultz, T., Abdulla, D., Ansari, A., Canlı, E., Keshavarz, M., Kiem, M., De O Martins, L. P., & De Oliveira, P. J. V. (2018). *What Is at Stake with Decolonizing Design? A Roundtable.* Design and Culture, 10(1), 81-101. https://doi.org/10.1080/17547075.2018.1434368

Simon, H. A. (1996). *The sciences of the artificial* (3rd ed.). Cambridge, Massachusetts: MIT Press.

Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*. Oxford University Press.

Sol, G. S. (2013). *Clarita Porset (1895-1981) y la influencia de la segunda modernidad en el diseño industrial en México.* Anales Del Instituto de Arte Americano e Investigaciones Estéticas. Mario J. Buschiazzo, 43(1), 37-54.

Song, B., Zhu, Q., & Luo, J. (2024). *Human-AI collaboration by design*. Proceedings of the Design Society, 4, 2247-2256. https://doi.org/10.1017/pds.2024.227

Stam, E., & Spigel, B. (2017). *Entrepreneurial ecosystems*. In Blackburn, B., de Clercq, D., Heinonen, J., & Wang,Z. (Eds.), Handbook for Entrepreneurship and Samll Business. SAGE. https://doi.org/10.4337/9781788975933.00009

Stenfors, S., Tanner, L., & Haapalinna, I. (2004). *Executive Use of Strategy Tools: Building Shared Understanding through Boundary Objects*. Business research.

Suárez Ceretti, V. (2011). *Una mirada histórica a la formación en Diseño Industrial—Centro de Diseño Industrial 1987-2009*. Montevideo: Universidad de la República.

Temeltas, H. (2017). *Collaboration and exchange between "Craftsman" and "Designer": Symbiosis towards Product Innovation*. The Design Journal, 20(sup1), S3713-S3723. https://doi.org/10.1080/14606925.2017.1352876

Temeltas, H., & Kaya, C. (2021). *Transfer of Craft Knowledge to New Product Development through Collaboration between Craftsmen and Designers*. The Design Journal, 24(6), 865–886. https://doi.org/10.1080/14606925.2021.1947947

Thorp, R. (1998). *Progreso, pobreza y exclusión: una historia económica de América Latina en el siglo XX*. Washington: Banco Interamericano de Desarrollo.

Torretta, N. B. (2023). *Take it personally: what may it take to become Designers for pluriversality?* Revista KEPES, 20(27), 19-46. https://doi.org/10.17151/kepes.2023.20.27.2

Valkenburg, R. C. (1998). *Shared understanding as a condition for team design*. Automation in Construction, 7(2-3), 111-121. https://doi.org/10.1016/s0926-5805(97)00058-

Valkenburg, A. R., & Dorst, C. (1998). *The reflective practice of design teams*. Design Studies, 19(3), 249-271. https://doi.org/10.1016/s0142-694x(98)00011-8

Van Dijk, J., & Van Der Lugt, R. (2013). *Scaffolds for design communication: Research through design of shared understanding in design meetings. Artificial Intelligence for Engineering Design*, Analysis and Manufacturing, 27(2), 121-131. https://doi.org/10.1017/S0890060413000024

Vita, J. (2023). *A dialogue about experiences of collaboration in design practice.* The Design Journal, 26(1), 173-183. https://doi.org/10.1080/14606925.2022.2144551

Whitney, P. (2015). *Design and the Economy of Choice*. She Ji: The Journal of Design, Economics, and Innovation, 1(1), 58-80. https://doi.org/10.1016/j.sheji.2015.09.001

Woolley, M. (2011). Beyond control: Rethinking industry and craft dynamics. Craft Research, 2(1), 11-36. https://doi.org/10.1386/crre.2.11_1

Yu, R., Gu, N., & Masoumzadeh, S. (2024). *Exploring the Impact of Digital Technologies on Team Collaborative Design*. Buildings. https://doi.org/10.3390/buildings14103263

Zahedi, M. & Tessier, T. (2019) *Tools for building consensus on goals*. The Design Journal, 22:sup1, 1439-1452. https://dot: 10.1080/14606925.2019.1594968

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