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Impact of technological facilitators in the design and artisanal production processes. The Guarda Ninhos Project - craft and design of Gonçalo's basketry

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Abstract: This research project analyses the impact of the use of prototyping and digital manufacturing tools in the development of new products based on the theme of Gonçalo's basketwork, in Guarda, Portugal [1]. Guarda Ninhos is an inclusive entrepreneurship project, the aim of which was to develop, produce and promote new local handicraft products. Solutions based on the socio-cultural, ecological and economic heritage of this region, knowledge immaterial heritage and expertise of their communities. Reinventing the culture of this place as a way of creating social and economic value, with the people who live there, was the followed line of action. Based on the results obtained, an attempt was made to outline forms of cooperation between this type of artisanal activities, with the most recent concepts of "industry 4.0" and industrial development methodologies - namely, (A) verifying the beneficial impact that the use of prototyping and digital fabrication tools can play in the design process of these products, optimising the development and production processes without jeopardising the premises that define the artisanal product; (B) contributing to the registration of ancestral knowledge and consolidation of artisanal processes and (C) showing how a strategic plan that aims to bring together and sustain the interdisciplinary artisan-designer relationship can be implemented.

Keywords: Design, Craftsmanship, Prototyping, Digital fabrication, Design process.

1. Introduction

Based on a theoretical foundation, the craft activity is essentially characterised by the predominantly manual performance, the "handmade" [2], although it is possible to admit the use of tools that do not affect the creativity or skill of the artisan, requiring their presence during the completion of the entire product production process. Through its forms, the product collects and expresses freely and spontaneously all the artisan's knowledge and talent, due to his autonomy in making decisions according to his experience and desires [3].

Today, the artisanal sector faces a period of adaptation. Current market guidelines force processes to be updated in order to speed up manufacturing times and reduce costs, while maintaining product quality.

Recognising this complex paradigm, in which the artisanal activity is found, and realising that the new trends in the industrial system are moving towards implementing methodologies that favor the customisation and singularisation of products, in order to satisfy the needs of each consumer, it is fundamental and urgent to consider methodologies that can enhance the two productive sectors [4].



Bearing in mind the evolution of handicrafts and industry (figure 1), since the industrial revolution and its relationship with R+D+I activities, at the present moment special attention should be given, within the industrial sectors, to design and manufacturing as well as to the approximation of “Industry 4.0” [5], which aiming at the excellence of production through technology, focuses its potential of innovation in the introduction of technological facilitators, allowing product customisation (among other things).

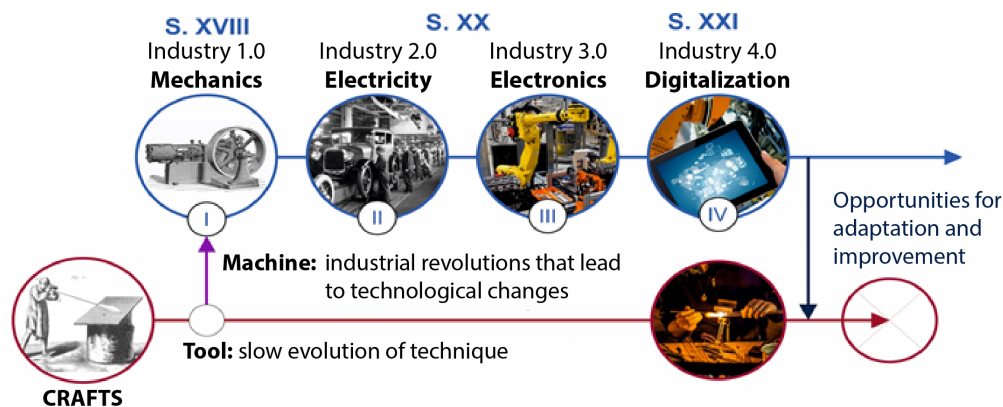


Figure 1. Evolution of technique and the productive sector: Artisanal and Industrial.

It should be highlighted that, although the focus of “Industry 4.0” regarding the development of the productive activity is centred on the industrial activity, it is transversal and projectable to other areas, such as the artisanal activity. Analysing the opportunities foreseen within “Industry 4.0” [6], digital facilitators provide an opportunity to streamline artisanal production processes without changing identity characteristics. They offer great application flexibility and can enhance the activity's expressiveness, as well as place its value on global markets in an economically sustainable way.

Nowadays, and recognising the importance of digital tools in the manipulation and management of information, it makes sense to consider its integration in the artisanal productive cycle development. This was what was proposed to do in the above mentioned project. To incorporate these tools throughout product development, demonstrating their outstanding relevance in the implemented methodologies [7].

Table 1. Identification common factors.

Fundamentals/Ideologies
Identity
Knowledge bases
Concepts
Work management
Management methods
Production processes
Production types
Resource management
End-of-life management

2. Methodology or Experimental Procedure

With the potential of computer-aided development tools, in addition to the technological advances in rapid prototyping, industrial manufacturing has sought to create ways to turn autonomous the development of each product. The harmony between these two tools has shown very interesting results from the creation/efficiency/sustainability relationship point of view. CAx tools, as well as PR technologies, can be perfectly compatible and positive for the recovery and revitalisation of craft

activities. Both have the potential to optimize the artisanal system [8] without, at any time, endanger the artisan's role as a nuclear pillar of artisanal manufacture, as was demonstrated in this case study.

For the development of the methodology, it was necessary to identify common factors which allow the establishment of a close relationship between the two production processes. From this analysis, it was possible to verify that both processes consider the same fluctuating reference parameters throughout the development and management cycles, as shown in table 1.

In addition to identifying the common analysis factors that allowed the characterisation and identification of contact points, interrelationships and convergences between the artisanal and industrial processes to be carried out, we also aimed at analysing the professional relationship between the artisan and the designer with the purpose of identifying opportunity areas (Figure 2).

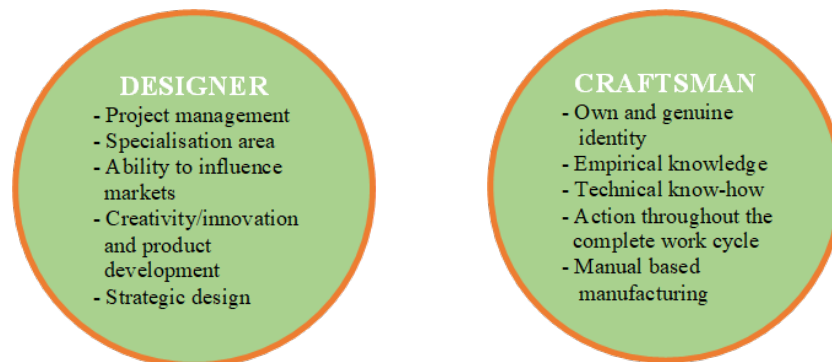


Figure 2. Professional relationship between the artisan and the designer.

After characterising and framing the production processes and their interdisciplinary relationship from the professional activity perspective, the methodology used in this project was defined in a process of co-creation (crafts + design), guided according to a broader strategy¹ that aimed at: (1) repositioning the brand “Basketry of Gonçalo” as a reference for local and global sustainability [9]; (2) creating systems that allow, from a social point of view, to call new players to the territory and (3) creating products and services that are representative of the local identity.

Through procedures that take into account (1) domain - through the systematisation of relevant techniques, moulds and drawings of Gonçalo's basketry to recreate new products, the systematisation work was based on publications such as that of “Baskets with Wings” [10]. Product families with an updated design and adapted to the productive capacities of artisans; (2) art - developing added-value products through association with recognised brands and authors (this operative dimension is oriented towards the creation of added value products - aesthetic, symbolic and economic value, resulting from the association with brands and authors recognised in the market. As in the case of the wicker chair and lounge, created by design superstar Marc Newson, produced by a community of basket weavers in Thailand and marketed by Idée. In this case, the products were developed by the Darga Crafts brand, which has been operating in Porto since 2009. In addition to this effective collaboration, AASE project partner has registered the interest of the renowned national artist Joana Vasconcelos, during the 2018 edition of FIA - Feira Internacional de Artesanato de Lisboa, in the sense of exploring Gonçalo's

¹ As an example, the creation of the Center for the Promotion and Valorisation of Gonçalo's Basketwork published in Diário da República, which aims to contribute to define the “Gonçalo Basketwork”, through “its material and artistic characteristics, to ensure its certification process”. In this sense, Guarda Ninhos is part of the Onep project, an European initiative whose main objective is the economic dynamism and the consequent creation of wealth in cross-border areas, mainly of rural scope, between Spain and Portugal. Its projects focus on the creation of new employment initiatives that promote employability in rural areas, especially regarding the professional insertion of persons with disabilities and / or incapacity or in situations of social exclusion. The consortium that develops the project is composed of entities from Castilla y León and Portugal and is part of the cross-border cooperation program interreg v-a spain - portugal (pocetp) 2014 - 2020.

basketry art and technique in the future) and (3) knowledge - generated through the development of products in actions, carried out in the field and in workshops, involving a small creative community and through development of an ethnobotanical study, consisting of a preliminary survey of the willow species (*Salix* spp.) used as raw material in wicker basketry in Gonçalo, in botanical and phytogeographic terms and the preliminary record of knowledge related to the way of cultivation and processing of the plant raw material and (4) systematising the results and disseminating them in different channels².

3. Results and Discussion

In the case study presented here, most products were prototyped locally (20 out of 22 products) using traditional technologies. Manufacturing techniques, which are used to grow and make the wicker final conformation and mechanised techniques, used to rip, ie to peel and section the wicker in different profiles.

The design of the new products was essentially based on the recreation of these techniques, associated with other materials that traditionally are not used in basketry, but that are typical and locally accessible.



Figure 3. The traditional basketry product.

Fall into this typology:

(1) The traditional basketry product line (figure 3). This action sought to create new initiatives regarding the occupation or employability of people in situations of social exclusion in rural areas, such as the case of the artisans Fernando Nelas and Hélder Saraiva. They are the beneficiaries of the project and participated in all its field activities, coordinated by designer Sérgio Lemos according to the following theoretical structure [11]. Eight new basket models, transport containers where geometric changes, materials or communicative details were introduced, reinventing old narratives associated with once popular baskets. The most appropriate techniques and materials were selected, given their accessibility and the design was “clean” with ornaments in a more contemporary and appealing language to the current consumer - we tried to design functional objects that incorporated a certain type of poetry which was different in relation to the devalued baskets of Gonçalo.

The eight new models have innovative characteristics in relation to their traditional versions: (1) German basket manufactured in three sizes and background colours (black, red and gold) to facilitate stacking and identification; (2) Alcobaça basket that integrates two wooden artefacts and a Guarda blanket t in the wicker body which serves to improve the comfort and safety of the user; (3) gypsy basket

² For example: GUARDA NINHOS_digital_catalog [1] and Ethnobotanical study of the raw material used in wicker basketry in Gonçalo (Guarda) [12].

manufactured in three sizes to facilitate stacking, with wool macramé details that give it greater character and comfort; (4) bicycle basket, a model that uses natural leather fastening straps so that it can be easily adapted to most types of bicycles; (5) fishing basket with a trout-shaped closure, which invokes the fish ecosystems of local rivers and streams; (6) firewood basket where wicker and wool were intertwined on a sisal rope structure for greater resistance and comfort for transporting firewood and other heavy objects; (7) laundry basket where wicker is exploited as a natural material that allows the creation of ventilated containers to store clothes. Cylindrical shape, the cover of which has details in wool and wood and (8) women's basket - its circular shape appeals to comfort and connotation with the feminine. In wicker, wood, wool and natural leather.

Although, in this case, traditional technological facilitators were used - wooden moulds produced in a local joinery, it is considered that the introduction of modern facilitators may contribute to the innovation of the design of this type of products. First of all, because this type of industry could become an alternative to the practically nonexistent industries of basketry moulds and because these technologies can facilitate the development of new designs and the production of components that improve the structural, functional and aesthetic characteristics of the basketry products.



Figure 4. Wicker structures.

(2) The Articles Nature line consists of four artistic wicker structures, unique pieces, from the Darga Crafts brand (figure 4). “Symbols of the art of weaving plant elements, from nests to other naturalist representations. Structures that intend to deconstruct functional basketry and its scale and explore new forms, materials, and meanings”. In this sense, and since the design was not aimed at replicating products, “technological facilitators” were not used.

(3) The products made in the residences of the artisan Olinda Xavier - eight masks in wicker and other plant elements (figure 5) - and of the Artist Carla Cabral - two nests made of wicker and wool (figure 6) - which result from the convergence between the language of the authors with the techniques and materials characteristic of Gonçalo’s basketry. In both cases, the “technological facilitators” consisted on the basket weavers, involved in a constructive process of the prototypes with the participation of the authors.

In the remaining two products were explored design solutions specifically oriented to prototyping and digital manufacturing. In the development of these products, we aimed at (1) Identifying contact points, interrelationships and convergences; (2) identifying areas of opportunity for the implementation of technological and digital facilitators; (3) developing a strategic plan and (4) validating the implementation of technological and digital facilitators.

Fall into this typology: Products resulting from artistic residency through the implementation of technological facilitators in the development of projects:



Figure 5. Artisan Olinda Xavier.



Figure 6. Artist Carla Cabral.



Figure 7. Digital modeling and laser cutting prototyping.

(1) Digitally manufactured wood agglomerate structure developed by the designer Bruno Alexandre which represents a human head. It consists of several interconnected pieces that guarantee the stability of the structure and allow the possibility to conduct and intertwine willow plants making the project a living structure. This project was developed based on technological facilitators, specifically, CAD tools and prototyping using laser cutting printers of wooden boards (figure 7). After the prototype has been built, it is used as a template for the construction of the metallic structure, which in turn allows the craftsman to interlace the wicker. This process, using technological facilitators, facilitated the communication between the stakeholders, the optimisation of the artisan's manufacturing processes, particularly by obtaining the mould in a shorter time and consequently with less costs. Upon completion of this project, a 20%-time reduction was observed in comparison to the entirely artisanal production process. On the other hand, it was also possible to conclude that the use of technological facilitators in

the initial and intermediate stages of the creative and production processes does not remove any craft identity from the final product. (2) Guarda Ninhos Souvenir - Nine wooden figures. The main objective of the creation of this family of products was to expand the offer of marketable products³ (figure 8). Several technological facilitators have been implemented in their prototyping. Namely, to perform: (1) machinery operations of the different wood components on the lathe copier (turning solid wood piece in a lathe copier); (2) drilling and sawing operations for surplus parts (drilling body and part; sawing excess); (3) assembly operations: gluing parts and stickers (assembly: gluing parts and adhesive) and (4) surface finishing operations. It was possible to introduce technological facilitators in all phases, except in the finishing phase. In the first phase, moulds were created, by laser cutting, of the different profiles of the parts to be copied on the lathe. These facilitators made it possible to analyse and correct the design during its development, create 2D prototypes and produce the moulds to be used in the industrial turning process with great accuracy and speed. In the second phase, moulds were created, by laser cutting, which allow positioning and indicating the drilling and cutting points of the parts, in order to systematise and optimize these operations, which are, in the entire production process, the ones that take more time to perform. In the third phase of the assembly, the use of digitally produced stickers made it possible to systematise and facilitate the production of the graphic elements of the products. This facilitator allowed the replacement of traditional, highly specialised and expensive manual painting techniques. The product packaging was also designed to be digitally produced. The printing, cutting and bending of the card were performed digitally, by companies that have the adequate technology for the graphic production of carton products in small series.



Figure 8. Development based on technological facilitators.

The use of these technological facilitators was fundamental for the prototyping and for the future sustainability of these products. They contributed to the optimisation and inclusiveness of the construction process through a digitally based design that links industrial technologies with semi-industrial and artisanal processes.

4. Conclusions

This research project presents conclusions that can answer questions that are usually asked in projects of this nature. For example, how can prototyping and digital fabrication be introduced in the design process? And how can these tools contribute to lessen design errors and help the team to develop appropriate and inclusive solutions for all project partners? The use of digital fabrication and prototyping brought great challenges and opportunities to all stages of the process: in conceptualisation (incubation);

³Guarda Ninhos souvenirs - wooden figures that represent characters from the community life of Gonçalo and Serra da Estrela, in danger of extinction: the shepherd; the Serra da Estrela dog; the sheep "the churra"; the cheesemaker; Inês; the Rooster; the Cherry tree; Pseudotsuga and the basket maker. These products are representative of the local identity and that can be used to promote the art of basketry and sold by local cultural agents - for example, museums, tourist offices and in the future Center for Valorisation of Basketry.

in the creation of the design (insight) and in the final development phase (transformation). The creation of 3D models for digital manufacturing allowed: (1) a greater rationalisation of the physical properties of some products that took into account the dimensions and characteristics of the prototyping equipment; (2) the optimisation of raw materials and production processes and (3) the improvement of the communication between stakeholders (artisans, designers and production engineers) throughout the creative and prototyping process. The use of technological facilitators as a whole also shows that their use can provide a more efficient registration and information management, both of the product and of the manufacturing process, as well as facilitating the recovery of information lost over time. Products that have lost their references could be revitalised again through the reproduction of virtual and prototyped models. We believe that the concepts, methodologies and digital tools applied in the industrial sphere can and should be carefully framed in the artisanal manufacturing systems as a means of revitalisation, enhancement and mainly as a determining factor for the sustainability of the artisan's professional activity, without ever distorting the original status of this activity.

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