

New Paths in Small Manufacturing: How is Digital Transformation Shaping Collaboration Between Designers and Craftspeople?

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Abstract

Collaboration between designers and craftspeople, or designers and small manufacturers, is a strategy aiming to revive the local manufacturing industry in countries impacted by post-industrial economic challenges. In this paper we examine a local initiative—a community of practice (CoP) composed of designers and craftspeople—by studying how they have used technology to collaborate, in order to identify opportunities for long-term growth of this community. To gain a deep understanding of the dynamics in the community, the collaboration process during the workshop and after it, we used a three-phase qualitative research strategy. We conducted interviews with the participants and staff, analyzed an 11-month period of communications in the WhatsApp group and, finally, conducted a co-design session. We identify opportunities and challenges related to the design and implementation of a personalized collaborative system that fulfills the needs of the users as individuals and community members.

Keywords

digital transformation, small manufacturing, community of practice, collaborative systems, innovation

Introduction

The rise of globalization had a negative impact on the manufacturing sector in western countries, as a consequence of outsourcing production, with a high impact on the textile industry (Murray, 2012). The manufacturing industry in countries such as Italy, United Kingdom or Spain went through this process, in which it is increasingly complex to find people engaged in the fabrication of textiles and there are practically no craft schools left. Globalization itself is a significant driver for digital transformation (Ulas, 2019).

Digital Transformation (DT) has been shaping industries for several years now, accelerating innovation, changing production processes, enabling communication and allowing small companies to compete on a local and global market as never before. External drivers such as customer demand, supply chain, innovation push, market pressure, laws/government were identified as being relevant for digital transformation in manufacturing (Liere-Netheler et al., 2018) as well as the change of

business practices with internet economy, e-commerce, and social media (Ulas, 2019).

From the consumer perspective, there are some initiatives—for example, the Italian Slow Movement (Karaosman et al., 2005; Petrini, 2006) or the Fair-Trade movement—that emerge as a reaction against consumerism and propose to revalue local products, by connecting consumers with producers and adopting a more ethical consuming behavior. SaberHacer (SH, in Spanish, “know how to make”) is one such initiative, a community project in Chile that aims to rescue the crafts of local small manufacturers through collaboration, learning development and design. SH was born in a context of

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continuous depreciation of the Chilean manufacturing sector since the '70s. While in its vision SH is geared toward crafts and small manufacturing in general, the first projects have been linked to the textile sector. Design is often defined as a problem-solving iterative process (Lahti et al., 2004) that attempts to find a solution for a real-world problem. In this context, SH places design as the core element of the collaboration process in the community.

The Italian model is one of the most studied, with other governments trying to replicate the “Italian miracle” based on the collaboration between manufacturers and designers (Verganti, 2009). In almost every case, the starting point is the idea that designers should collaborate with local producers and that authorities should encourage this type of collaboration. Dell’Era and Verganti (2007) proposed to migrate the model of the design-manufacturer one-to-one collaboration to an extended network in which one manufacturer would collaborate with several designers to get better quality results. Furthermore, the classic model of local collaboration is questioned, proposing a global vision: the inclusion of “interpreters” to increase value, and teaching design to business leaders. Interpreters could be educational or research institutions, cultural organizations, technology providers, retail and logistics companies or people in general. In other words, there is a proposal for a collaboration ecosystem more than a close one-to-one designer-manufacturer relationship, as ecosystems are critical in digital transformation (Mandviwalla & Flanagan, 2021).

Collaboration between designers and craftspeople allows not only for the craftsperson to develop product design capabilities and eventually find a new market for their products, but it also allows the designer to increase their design horizons (Tung & Chen, 2013). Despite a romantic view of what designers could contribute to producers, these communities are not only about rescuing traditions and manufacturing sectors affected by globalization, but they are also expected to create innovation opportunities based on the mix of the formal design process knowledge that the designer brings and the craftsperson’s experience. Almost by definition, both designers and craftspeople are entrepreneurs. Several of the challenges faced by designer-craftspeople communities, for example, long-term collaboration and knowledge, are also present in other types of communities.

A community of practice (CoP) is a group of people that “share a concern or a passion for something they do and learn how to do it better as they interact regularly” (Wenger et al., 2002). Through CoPs, entrepreneurs acquire resources and share knowledge (Hafeez et al., 2019; Hara & Foon Hew, 2007). Our research motivation is to examine how the use of technology impacts the

sustainability of a CoP composed of designers and craftspeople. By analyzing the SH CoP formation in Chile, we contribute with a research case from a less developed, emerging economy, where digitization and technology adoption by small and medium businesses has been slow or nonexistent (Akpan & Ibidunni, 2021).

Our main research question is: How does a *CoP* of designers and manufacturers use technology to maintain long-term collaboration? To achieve this goal, we examine the SH project as a first step to identify opportunities for supporting and maintaining collaboration through technology and characterize the collaboration between designers and small manufacturers and how they use technology in the process. This paper is organized as follows. Section 2 reviews the related work on technology-mediated collaboration in CoPs. Then, we explain the context of our research. Section 4 describes the methodology of our research, including the selection of data source, data collection and analysis. Section 5 presents our findings. Finally, in section 6 we present our conclusion and identify opportunities for future work.

Related Work

The digital transformation framework “includes the networking of actors such as businesses and customers across all value-added chain segments, and the application of new technologies” (Schallmo et al., 2017). DT involves data extraction, exchange, and analysis, and then the use of that data for decision-making and activity initiation (Schallmo et al., 2017). Digitization, the change in the business models and processes are fundamental pillars in digital transformation, but the change in the way we work and collaborate is certainly a significant enabler and an outcome at the same time. The future of work is being shaped during this fourth industrial revolution (Lewkowicz & Liron, 2019).

Computer-supported cooperative work, or CSCW, addresses “how collaborative activities and their coordination can be supported by means of computer systems” (Carstensen & Schmidt, 1999). The impact of collaborative software in a new product development went from a poor presence (Verganti, 2009) to triggering a high interest for academic research in the past years (Addas & Pinsonneault, 2016). This research area has also become interested in recent years in the maker movement, or maker culture—in which individuals create, or make, things (Papavlasopoulou et al., 2017). This movement encompasses a wide range of activities—from tools and tech to sewing machines and soldering irons (Meissner et al., 2019). However, studies into craft-based maker culture have found participants to be looking for socialization, or an outlet, without explicitly forming a community (Vyas, 2019).

Table 1. Designer—Craftsperson Collaboration Initiatives.

Project name	Country	Involved actors	Area	Project type	Technology employed	Reference
NS	Finland	Designers (that are also doing the seamstress job)—students	Textile	Academic	Future Learning Environment	Lahti et al. (2004)
NS	Portugal	Designers (students)—craftspeople (students)	Crafts	Academic	Computer-aided design (CAD)	Alexandre et al. (2015)
Teixidors	Spain	Designers—Weaver	Textile	Industry	NS	Padovani and Whittaker (2015)
Yii	Taiwan	Designers—craftspeople	Rush-weaving	Industry	NS	Tung and Chen (2013)
NS	UK	Designers—Furniture maker	Furniture	Industry	Computer Numerical Control (CNC)	Cheatle and Jackson (2014)
Sara Thorn	Australia—India	Designer + Architect—craftspeople	Textile	Industry	NS	Murray (2012)
polly&me	Australia—Pakistan	Designer—Embroiderers	Textile	Industry	Digital camera	Murray (2012)
Martina Dempf	Germany—South Africa, Rwanda	Jeweler/Anthropologist—Jewelers	Jewelry	Industry	NS	Murray (2012)
NS	USA—India	Designer—craftspeople	Textile	Industry	NS	Emmett (2014)

NS: not specified

Several national and local initiatives have been trying to encourage designer—craftsperson collaboration. Table 1 synthesizes some of them. Regarding these projects, we can distinguish between projects involving designers and craftspeople located in the same country (Alexandre et al., 2015; Cheatle & Jackson, 2014; Lahti et al., 2004; Padovani & Whittaker, 2015; Tung & Chen, 2013) or in different countries (Emmett, 2014; Murray, 2012). The three case studies presented by Murray (2012) were developed in an outsourcing logic, in which designers and craftspeople would collaborate in a first one-shot project and then the designer would continue to outsource components from the non-western country. Collaboration occurs then between western designers and non-western artisans. As the author observes, there is certainly a romantic practice motivated by the mission of recovering lost traditions. To reinforce this process, “communication occurs mostly in black and white on paper, rather than through conversations that are vulnerable to mistranslation” (Murray, 2012). For these three case studies, the only technological artifact mentioned is a digital camera.

When looking at CSCW research that is specifically related to collaborative design projects, we find that the use of technology in these collaborative projects is mainly related to the fabrication process itself, through technologies such as computer-aided design and computer numerical control. The use of these advanced technologies is a pillar for the digital transformation of the manufacturing processes (Ulas, 2019) but there is a need for more capabilities in order to transform an organization and a supply chain through collaboration. Only Lahti et al. (2004) reports the use of a collaborative system, the Future Learning Environment (FLE), as a way to support other aspects of collaboration in a design process, such as communication or coordination. By analyzing the interactions and communications through this platform, researchers were able to identify the structure of the design process. There is a research setting difference with our project: the FLE system is proposed as a collaborative system, while in our project, participants create their own spontaneous collaboration digital infrastructure and in a second step, they are involved in a co-design process to define how collaboration should be continued. Also, FLE is used as part of an academic study, while SH is based on a real-life case. Nevertheless, the digital versus not-digital separation of collaboration in a design and fabrication process is not always obvious, nor necessary, as what matters most is the activity flow or, to be more specific, the “circulatory flow of the material practice” (Rosner, 2012).

Based on the origin of the technology used as a collaborative system in the previously mentioned projects, there are standard ones (systems designed and built for

this specific purpose), custom made (one that an organization develops for their own internal use) and systems built for other primary purposes that users or organizations adopt in order to collaborate. Instant messaging applications (e.g., WhatsApp) are a part of this last category, are useful in resource-poor contexts (Willemse, 2015) and have a high capacity to support learning and improve knowledge creation. Users create communication places with these types of applications, based on their previous experiences and the constraints and features of the applications (Nouwens et al., 2017).

An instant messaging group then becomes a virtual space for teamwork as the only space the team has, or as an extension of face-to-face collaboration, as it is the case in the SH community. The WhatsApp instant messaging application has been used in education and healthcare research. The impact of WhatsApp in communication and discourse has generated academic research (Sánchez-Moya & Cruz-Moya, 2015). To the best of our knowledge, this is the first study in which the use of WhatsApp in a design team or CoP is undertaken. In the case of this study, participants were asked to share their experience after they had already used the application, instead of being asked to join as part of an academic study, as has been the case in previous research.

A Brief History of the SaberHacer Project

The object of this research is the SH project—a community of practice. SH started with an intervention initiative that gathered designers and textile craftspeople into a co-design workshop formulated to solve design challenges. Co-design workshops are a type of research and development activity executed as a need to adjust the supply chain in digital transformation in manufacturing businesses (Liere-Netheler et al., 2018).

SH began with an intensive 4-day co-design workshop, with 14 participants (designers and craftspeople). After an introduction about co-design and the importance of running a design process before proposing a solution to a real problem, teams of 3 to 4 participants were formed; they received materials, had access to digital fabrication tools and spontaneously started to collaborate to solve each challenge.

During the workshop, participants were expected to apply their specific knowledge and experience to the main challenge, that is, to bring co-designed products on the market, based on collaboration. In this context, designers contributed with their theoretical and practical understanding of a design process from user needs research to prototyping and creativity, while the craftspeople brought their knowledge and know-how on the fabrication, materials, tools and possibilities in order to solve specific problems. They both collaborated and

co-designed, meaning these roles were flexible in an open space from an innovation and problem-solving perspective. As designers have an inner knowledge of the design process, they tended to naturally lead the dynamics during the workshop, being also trained to involve craftspeople from a problem-solving mindset and not merely reduce their role to the execution of a designed product. As an example challenge, one of the teams had to propose a solution for young children that were going to school very early in the morning and needed to be visible to car drivers.

After the workshop, a WhatsApp group was created by the project coordinator in order to maintain and facilitate further communication. All participants were added to the group after the workshop. This initiative was the first SH generation.

The results from the first generation were encouraging, and all teams came up with a fast prototype, so a second workshop was arranged, with a new group of designers and craftspeople, who became the second SH generation. In the meantime, the project started to interest local authorities, facilitated the creation of co-designed products that went to market and finally had public funding to support their activities. This brought a full-time permanent team to allow the community to grow and extend to other craft specialties. Today, SH defines itself as a local-knowledge producing platform, encouraging the assessment of crafts, design and local manufacture.

SH has involved two main actors in each generation: the designer and the craftspeople. For the purpose of this research project, we consider craftspeople both craftspeople and small manufacturing business owners, as for most of them, the main motivation is economic need and not the creation of goods or artifacts, but they are not fully manufacturers either as most of them lack formality. Therefore, they could also be called “utilitarian craftspeople,” since they craft goods that “serve a concrete use” (Klamer, 2012).

As technology possibilities have increased in the past years, DT has been an enabler for all the SH activities since this project was born, allowing to create a bridge between different stakeholders and ultimately approach the challenge of rescuing traditional crafts, creating new innovative products and getting them to the market.

Methodology

To gain a deep understanding of the dynamics in the SH community, the collaboration process during the workshop and after it, we used a three-phase qualitative research strategy. Phases 1 and 2 were carried out concurrently. We conducted interviews with the participants and staff, analyzed an 11-month period of

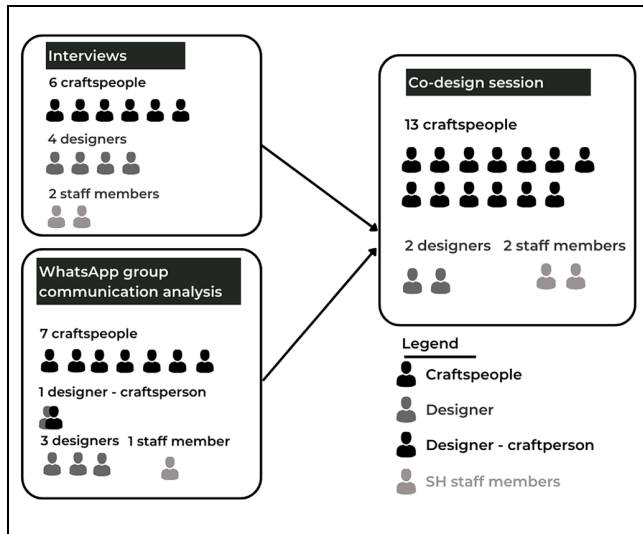


Figure 1. Research strategy.

communications in the WhatsApp group, and, finally, conducted a co-design session. Details of each phase are presented in Section 4.2 and illustrated in Figure 1. The interview was used to gain a personal perspective of each role, as well as to understand how collaboration was undertaken after the workshop and how they maintained communication. As a Whatsapp was purposefully created by the project coordinator, we decided to explore data from the Whatsapp group, which allowed us to discover the “what,” while the interviews brought light on the understanding on the “why”: motivations to participate, to belong to the CoP, and the dynamic during and after the workshop.

Participants

The designers involved in the project are young designers (under 35 years old) coming from generalist design undergraduate/master’s programs—meaning they are trained on design processes as a whole and they are not specialized in a design area. They rather learn about product design, service and experience design, trends, designing with analog and digital tools in mind, while craftspeople are 40 to 60 years old seamstresses, most of them without formal training.

We interviewed 12 participants (six craftspeople, four designers, and two staff members) from both SH generations, and the co-design session was attended by 17 participants (13 craftspeople, two designers, and two staff members) from both generations as well. We analyzed Whatsapp data from the second generation of SH, consisting of seven craftspeople, one designer-craftsperson, three designers, and one staff member.

Research Method

Phase 1: We individually interviewed 10 participants and also had a group interview with two of the staff members of SH. The questions that were asked pertained to the interviewee’s general background (e.g., “Tell me about your work”), experience with SH (e.g., “How was your participation in SaberHacer?”), and collaboration during and after the workshop (e.g., “How did you share information during the workshop project?,” “Are you still in touch with your team?”). All semi-structured interviews were audio recorded and later transcribed for analysis.

Phase 2: In order to characterize and better understand the interactions between CoP members after the workshop, we analyzed an 11-month period of communications in the WhatsApp group pertaining to the second generation of SH workshop participants. Whatsapp was the main communication channel used by SH after each workshop took place. The group was still active 1 year after its creation, when we had access to its data and had the following members: one creator (the project coordinator), three designers, seven craftspeople, and one designer-craftsperson. One craftsperson abandoned the group during the period, for undisclosed reasons. Only one participant of the workshop was never included in the group because they are not a mobile technology user.

Phase 3: We conducted a co-design session with 17 participants, including small manufacturers and designers from both generations that had previously participated in the SH workshops and members of the SH staff. The co-design intervention aimed to validate the findings of the interviews and WhatsApp analysis and identify ways that the CoP growth can be supported. For this purpose, we presented the findings of the previous two phases—mainly the challenge to continue the CoP after the initial workshop, and that WhatsApp is not the ideal channel to pursue communication and follow up on specific topics—and asked them to brainstorm possible solutions.

On this occasion, the co-design session was attended by 13 small manufacturers, two designers, and two members of the SH team. The activity started with an icebreaker activity, followed by the previously mentioned challenge, on how to collaborate after the workshop. They met in teams formed by one designer and four or five craftspeople to discuss these issues, documenting their proposals (Figure 2). The co-design session also allowed us to gather new insights as “insider knowledge” (Steen et al., 2011) regarding perceptions on roles and individual status in the CoP and during everyday work life.

Analysis

We used thematic analysis to analyze our data. Four of the researchers involved in these projects were only

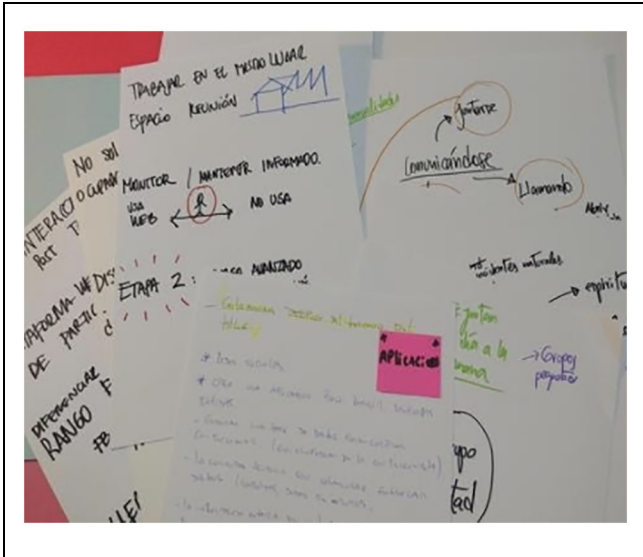


Figure 2. Co-design artifacts.

acting as researchers, while one had a “researcher as a participant” active role. When the author becomes a research subject, they are socially included and their participation facilitates the understanding of the practice (Rosner, 2012). The “researcher as a participant” is a former master degree student, motivated to build bridges between designers and craftspeople. They were not involved in the execution or the analysis of the interviews. Therefore there was no conflict of interest during the research project.

Coding, grouping and analyzing Whatsapp messages from the second SH generation group, allowed us to identify topics of interest in the community. The coding and grouping process was performed using Atlas.ti software and a thematic network analysis was performed. As a way of representing the output of a thematic analysis, the thematic network offers a “web-like network as an organizing principle and a representational means, and it makes explicit the procedures that may be employed in going from text to interpretation” (Attride, 2001).

Findings

Narratives and Community Descriptors Over Time

The evolution of WhatsApp message frequency over time shows a continuous interaction between community members, which is one of the signs that we are in the presence of an active CoP (Figure 3). We found active communications took place during 10 months, with 1 month being characterized by no messages at all (July). The coordinator thought this could be attributed to him being occupied with coordinating other activities, like applying to public funds. Considering also that January–

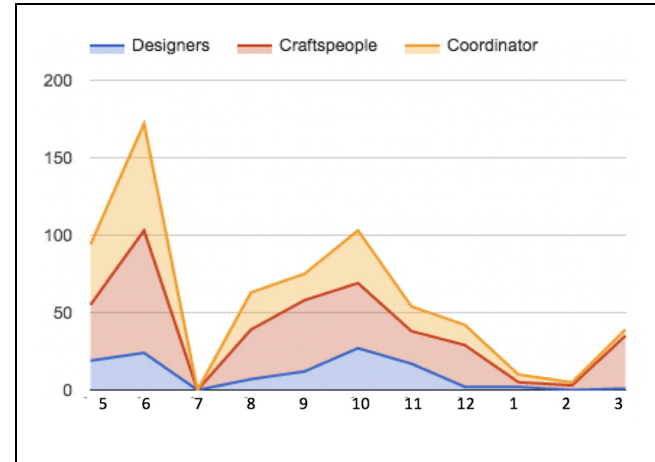


Figure 3. Evolution of Whatsapp communication over time: months (May = 5 to March = 3) versus number of messages.

February is a holiday period during Chilean summer and working activities start over in March, we believe the timeline below represents an indicator of active interaction, as one of the indicators of community creation.

Regarding the distribution of statements between designers and craftspeople, if we do not consider the coordinator’s statements, the distribution is similar: designers wrote an average of 36 statements during the period, while craftspeople wrote 48. Instead, if we ignore the participation of the designer-craftsperson and the coordinator, designers seem to be contributing less in terms of statements (24 per designer vs. 49 per crafts-person). Obviously, this distribution does not include the value or the complexity of the message; it only looks at how often each profile participates in the conversation. All participants contributed at some point in the past 11 months, some of them more than others: extreme cases being of one designer that contributed with only 12 statements, and one that contributed 85. The highest contribution over the period was from the group’s coordinator (211 statements). By taking on a moderator role and being a senior member of the SH project, the coordinator is permanently facilitating the group interaction. This finding is in line with previous research of CoP that found senior members and moderators to play a fundamental role in stimulating the conversations in a community (Hafeez et al., 2019). Our findings are also consistent with previous research that found that people share their knowledge in a CoP when they have the experience to share and are structurally embedded in a network (Molly McLure & Samer, 2005). The evolution of Whatsapp communication over time shows that continuous sharing is a habit in the group.

By coding 517 statements we identified seven groups of codes—each one describing a specific area of interest

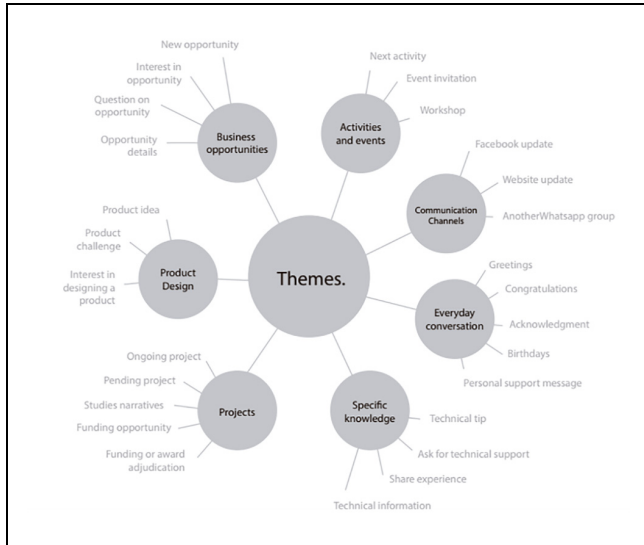


Figure 4. Themes of communication within the group.

(Figure 4): business opportunities, activities and events, communication channels, everyday conversation, specific knowledge, projects and product design. The following sections describe our findings, structured into four sections: findings regarding people, practice, technology and knowledge creation. We provide quotes from participants, translated from Spanish, and identified with the participant type (D for designer, C for craftspeople) and an identifying number, as well as the origin of the quote (e.g., interview, WhatsApp).

The People

Both Craftspeople and Designers Have an Equitable Role, With No Clear Hierarchies. The challenge of the workshop was to create innovative products based on a real problem. When asked to comment on their experience, all participants said interaction was equitable (meaning no hierarchical position) and they saw no role distinction in their respective groups, with no social, economic, academic or age-based distinction. In similar collaborations, the designer tends to be more proactive in terms of initiating the project and consequently, it is almost impossible to establish a situation of equality (Murray, 2012). We believe that SH's dynamic, involving designer and craftspeople as equal members from the beginning of the design challenge is the main factor that puts both roles in an equitable position. As other authors mentioned, collaboration surges between pairs (Perret-Clermont, 1984), but it can also be understood as a staging that an expert creates to an apprentice in order for them to appropriate capacities and skills necessary for a task. Traditionally, similar collaborative projects situate the designer as an expert and the craftspeople as an apprentice.

Another particularity of the workshops is the process of learning through collaboration. An important aspect of collaboration is the commitment of all participants, avoiding egoism, resource appropriation, making pertinent use of these resources and sharing technical knowledge. This is consistent with Wenger's definition of a CoP (Wenger et al., 2002) and with other authors who mention that the core of collaboration is sharing the significance of the task (Lalueza et al., 2009).

When looking at the specific role of the designer, they are expected to provide the theoretical knowledge and the expression of ideas that were not previously visible to a person unschooled in this branch: "The ladies propose ideas only based on what they know, I tell them 'good, now let's give it another look' (...)" (D1, interview). As for the craftspeople, their role is to contribute with abilities and manual skills, obtained through experience: "(...) the lady that was older (...) she is really good at sewing, really good. Experience has a great value..." (D2, interview).

Young designers are digital natives and they have been using technology during their formal education, while craftspeople had to adopt technology for personal and entrepreneurial purposes. They became mobile heavy users even if they had only a basic knowledge of working with a computer—one of them even mentioned a family member was helping with Excel for accounting. We notice that the massive adoption of communication platforms such as Whatsapp in Chile (and in Latin America in general) but also the practice of using social media to communicate with potential clients, has been an enabler for collaboration between these two different worlds. Building on this interest to adopt digital platforms is a strategy allowing to mitigate resistance to change, a challenge related to digital transformation in manufacturing industries (Albukhitan, 2020).

There is a Need to Revalue the Utilitarian Craftspeople. Despite an "egalitarian perception" of both roles, when they were asked to fill in the agreement for research participation, a relevant number of seamstresses declared they were housewives instead of craftspeople or small manufacturers. In both scenarios, this requires further analysis, as it might be a determining factor in terms of communicating the community's profiles and filtering future applications during recruitment sessions or spontaneous applications. On the other hand, during interviews, designers highlighted their need to have a professional counterpart from the small manufacturers, as in a lot of projects, they design artifacts they need to produce, and this production process has to be professional. Indirectly, this finding might suggest that formal training should be provided to the craftspeople, so that they professionalize their technical and technological

capabilities. In this context, mobile communication and social media actual adoption for communicating with clients and business partners is a first step to approach this challenge.

Everyday Conversation Allows for Personal Involvement to Enrich Professional Participation. The use of instant messaging applications allows people to create narratives, which makes them become storytellers by creating content continuously, not only with text but also with other types of content, for example, images. Ultimately, WhatsApp becomes a way of dwelling (O'Hara et al., 2014). In our research, everyday conversations were present in the WhatsApp group mainly on topics related to greetings, birthdays, acknowledgments, sharing personal messages or asking for support. Sometimes, this goes beyond greetings and short messages. The interaction requires the members of the group to take action or participate when someone requires it. A typical case is a craftsman involved in a local neighborhood initiative against violence—they would ask people to vote online so their project would get financial support. These interactions enrich the CoP with a more personal approach that seems to strengthen the relationships between members. Three examples of these types of messages are provided below:

- C5, WhatsApp: “You can vote for our project on the Internet, our project is number 48”
- C6, WhatsApp: “How are you guys? The earthquake was pretty rough.”
- C4, WhatsApp: “Send me your birthday date and I'll create a calendar.”

The Practice

Business Opportunities Arise and Need for a Formal Follow-Up Process. We observed that most of the mentions of new business opportunities came from the coordinator (8 out of 13), while five came from three craftspeople. When a new opportunity was mentioned, some craftspeople would show their interest. Based on the interview with the project coordinator and content review of the SH website and Facebook page, during the 11-month period, only one specific follow-up was made on a requirement received from a local design studio. This process showed no concluding result, as the design studio did not answer to follow back communications. Regarding the other 12 opportunities, in some cases the group did not react, the thread was lost between the rest of the themes, as WhatsApp is a channel that requires immediate reaction, especially in large groups in which conversation flows are important. In other cases, someone showed interest, but because of the scope being too large for one person and the SH coordination and reaction time too slow, the

opportunity got lost. The following are three examples of this issue:

- Coordinator, WhatsApp: “A guy called me and he needed 3.000 banners (...) I would like to take it as a community project but we need a fabrication studio.”
- C1, WhatsApp: “I need to recommend a seamstress to designers that are designing pants.”
- C2, WhatsApp: “Is someone making teddy bears?”

There is a Need for Specific Communication Channels for Specific Purposes. Participants shared thoughts on the communication channels used to promote SH activities and products, such as Facebook and the website:

- Coordinator, WhatsApp: “If you want to, we could publish your textiles on the SH Facebook page.”
- Coordinator, WhatsApp: “The patterns are online, in case someone wants to download them and start producing.”

The coordinator also created other WhatsApp groups for specific projects, like a quote for a possible client. This idea of creating a parallel group, might suggest that one standalone WhatsApp generates an overdose of notifications for members who are not actively involved in all activities. Collaboration allows them to capture more value on the market and compete with other small and medium manufacturing local companies. This is a core value of SH: allowing local small businesses to grow through innovation and collaboration. Digital systems like WhatsApp help SH in performing their mission. Using existing technology that users are already familiar with—like WhatsApp and social media—is one of the first steps in embracing digital transformation.

Product Design Narratives Surge Beyond the Workshop Dynamics. Product design statements are related to the design challenges of the first workshop where the participants met, to interest in developing new products based on the old ones or to a product idea that one has in mind and wants to share with the community:

- Coordinator, WhatsApp: “Today it was so cold that I had to use our cowl (note: the one designed in the workshop) and it was really cool :) You should produce it, sales would be great”.
- C1, WhatsApp: “We have to investigate and experiment, something interesting would come up.”

Ongoing Projects Could Articulate Future Collaboration in Small Teams. Narratives on ongoing or pending projects were actively shared by the community members during the 11-month period:

- C1, WhatsApp: “I’m working on the cowls of the national soccer team.”
- C2, WhatsApp: “Working with a university on some videos...defining details.”
- C3, WhatsApp: “Now at the local meeting, I’m running around like crazy.”

Additionally, some of them shared information on public funding for future projects, as a way of contributing to community growth. This theme is both related to the everyday conversation and the opportunities one. As a matter of fact, informing the community about ongoing projects is a way of enriching the everyday conversation and also a starting point for generating new job or business opportunities.

For Activities and Events to Gain Traction, WhatsApp Use is Limited. The “Activities and events” theme includes statements on the following topics: activity proposal, interest in next activity, details on next activity, event invitation, event details, workshop proposal, narrative on workshop, confirm/refuse assistance, activity inquiry, narrative on past event (“So, when should we have the community coffee?”; “We have someone here from Finland” (coordinator, WhatsApp)).

Activities and events are occasions to generate community networking in a physical space and group reactions in a virtual community. People were quick to indicate their interest to attend activities or their lack of availability. At least one workshop proposal was canceled during the period because of the lack of potential attendance. This proposal was made by the coordinator in the name of a craftsperson—we believe this kind of communication and future notifications could be proactively announced by each community member. Findings show that WhatsApp is useful for communicating future activities and events, but this is not enough for gaining traction and informing organizers who exactly is going to attend. In this context, Facebook seems more appropriate, as most participants could confirm they would attend an event. There seems to be a technological barrier though, as some older craftspeople are not active Facebook members.

Moreover, as mentioned before, a general WhatsApp group is not the appropriate channel to coordinate more specific activities, such as preparing a client quote, as this would create too much noise. Therefore, during this project, the coordinator created other WhatsApp groups that allowed the team to accomplish these specific tasks.

The Technology

Technology Leap and the Effect of Digital Skills in the Use of Technology for Collaboration. Based on the contribution frequency in the group, the patterns observed during the interview and the online activity of each one of participants for promoting their brands, three relevant insights stand out: (1) craftspeople have high mobile technology adoption; they all use their smartphone to communicate with clients/providers and to promote their work; (2) craftspeople feel less empowered than designers when it comes to the use of computer and they feel they lack digital marketing tools and knowledge; (3) craftspeople had a technological leap from no use of computer at all to being heavy users of mobile phones, which makes them feel everything should be solved through the phone; (4) designers spend more time in front of their computer, have a personal or studio brand presence on social media and feel comfortable manipulating digital tools. In this context, a collaborative system for this CoP should support mobile usage, without ignoring desktop users. Taking into account the specific characteristics of the CoP members would facilitate the adoption of the system, as technophobia and limited computer skills are considered “factors limiting collaboration among members of communities of practice” (Nyagwencha et al., 2011). Technical requirements—as those related to specific devices and operating system compatibility with WhatsApp—were not found to be an obstacle for joining the WhatsApp group, as was the case in other studies on collaboration using this instant messaging application (Willemse, 2015).

Recurrent Face-to-Face Interaction Should Support the Sustainability of the CoP. In terms of motivating future interaction after the workshop, both designers and small manufacturers believe that physical interaction is important for generating long term collaboration: “(...) all people are not necessarily on the Internet, despite the fact that today this is how things work (...) That’s why we need an alternative way to be in contact, like a facilitator or someone that would be online and could make phone calls (...)” (C1, interview). When it comes to group forming, within organizations there are groups that emerge naturally as a response to social contact (Sanz & Pérez, 2009)—the SH community is one of these groups. In this context, SH has the challenge to create physical spaces for group gathering that make the CoP go beyond a virtual community or periodic workshops. This balance between digital and analog communication is currently known as “slow communication” (Serrano, 2014) and it is based on the value of physical spaces versus online, as a way of putting technology to the service of the people.

As mentioned in section 5.3, using an existing technology such as Whatsapp, that users are already familiar with, facilitates the formation of CoPs because it enables building upon existing habits without adding technological frictions and avoiding an additional learning process curve. Nevertheless, Whatsapp as a channel might become limited when it comes to properly articulating complex interactions and deep communication.

Knowledge Creation

Learning as the Main Motivation for Joining the CoP. The main motivation coming from the small manufacturers is the need to learn in order to professionalize their crafting techniques, learn from the designers and acquire complementary skills for their businesses (e.g., digital marketing, promotion or sales skills). On the other hand, designers expect to discover counterparts for future collaboration and they are also emotionally involved with the mission and vision of SH, as they previously knew the coordinator, who is also a designer. Small manufacturers became emotionally involved after their first workshop and once they started to have a permanent link with the community.

There is a Need for a Process to Support Specific Knowledge Creation in Time. Knowledge sharing and expertise sharing have been thoroughly explored in the CSCW literature (Ackerman et al., 2013). One of the characteristics of a CoP is the practice of a specific passion or craft. Therefore, the presence of specific knowledge as a continuous point of interaction between the members validates the creation of a CoP. This theme emerged as a result of several topics: “technical tip,” “ask for technical support,” “technical information” and “share experience.” We differentiate “technical tip” from “technical information,” as the first code includes tips on materials or techniques, and the second one is more related to a specific direction where one could buy the materials—for example, the name of a store, a road, or a subway station, as these three examples illustrate:

- C4, WhatsApp: “I have doubts about the washing”
- C5, WhatsApp: “This is why is better to use polyester textiles but the cotton is more comfortable”
- C1, WhatsApp: “The bad thing about the cotton is it gets dirty and the dirty spots are difficult to wash, this is why it’s better to use only some degree of cotton.”

The idea of creating and sharing specific knowledge is particularly challenging for SH as a growing CoP. Gathering this content, editing, proofing and publishing could be an activity supported by a permanent SH team

member, someone that should have writing skills and a deep understanding of the community dynamics. At this time, this knowledge is rather tacit, which means that “we can know more than we can tell” (Polanyi, 1997). Traditionally, there are two ways of expanding this tacit knowledge from craftspeople: the master/apprentice model and the co-creation model (Chuenrudeemol et al., 2012). The SH workshops are framed into the co-design model, as a particular instance between designers and people not trained in design (Sanders & Stappers, 2008) our findings suggest there is definitely an opportunity to retrieve this knowledge at a larger scale by using collaborative systems. Managing knowledge is a new challenge for CoPs within organizations. Even if CoPs have existed for years, understanding how to manage knowledge as an asset for competitive advantage and how to get along within the knowledge economy are new challenges. Using information technology in this context has been more about creating databases that become “digital junkyards” (Wenger et al., 2002) instead of being valuable assets.

WhatsApp Allows on-Time Information Sharing But Does Not Properly Support Knowledge Creation. Even though WhatsApp is useful for sharing information as a spontaneous communication channel, the flow becomes difficult to manage when the group grows, when there is a need for follow-up (as in small project management scenarios), but also when someone tries to search for past information on a particular technical theme. Even if the group channels on WhatsApp have a search function, this feature is not enough for generating knowledge and it is not commonly used by the craftspeople, although the designers do use it. Considering that the community is currently relatively small but it will be growing through the recently obtained funding and the project is to get to more than 100 active members in the next year, the findings of this research show that WhatsApp does not properly support all the collaboration process in this CoP and there is a need for another collaborative system. Moreover, creating a knowledge base is a process that requires careful consideration, as “computer - supported collaborative environments for knowledge building provide a promising innovation to facilitate teamwork” (Lahti et al., 2004).

The co-design session allowed identifying that a basic need for the CoP is to share information effectively. The participants proposed to create an easy to access “virtual encyclopedia” that would contain technical information such as patterns for product fabrication, prices for textiles, and also work opportunities and notifications for future community activities. As mentioned in other research projects, mobile apps allow accessing significant information and services (Figueira, 2014). A similar

Table 2. Summary of Findings, Insights, Source of Data, and Themes of Communication.

Findings	Insights	Main source	Themes of communication within the group (Figure 4)
Narratives and community descriptors over time	The evolution of WhatsApp message frequency over time shows a continuous interaction—one of the signs that we are in the presence of an active CoP. The coordinator is permanently facilitating the group interaction. Continuous sharing is a habit in the group.	WhatsApp	Business opportunities Activities and events Communication Channels Everyday conversation Specific knowledge Projects Product Design
The people	Both craftspeople and designers have an equitable role, with no clear hierarchies There is a need to revalue the utilitarian craftspeople Everyday conversation allows for personal involvement to enrich professional participation	Interviews Interviews WhatsApp	Everyday conversation
The practice	Business opportunities arise and need for a formal follow-up process There is a need for specific communication channels for specific purposes Product design narratives surge beyond the workshop dynamics Ongoing projects could articulate future collaboration in small teams For activities and events to gain traction, WhatsApp use is limited	WhatsApp, Interviews WhatsApp, Interviews WhatsApp WhatsApp WhatsApp, Interviews	Business opportunities Communication channels Product design Projects Activities and events
The technology	Technology leap and the effect of digital skills in the use of technology for collaboration Recurrent face-to-face interaction should support the sustainability of the CoP	Interviews Interviews	
Knowledge Creation	Learning as the main motivation for joining the CoP There is a need for a process to support specific knowledge creation in time WhatsApp allows on-time information sharing but does not properly support knowledge creation	WhatsApp, Interviews WhatsApp Co-design session	Specific knowledge Specific knowledge

initiative aiming to preserve data on crafting was created in Colombia (Pinzón, 2014). Co-designing by involving small business owners is a technique allowing to mitigate the challenges of digital transformation in traditional industries, allowing to reduce the risk of failure or resistance to change their practices. Moreover, when two different groups—as craftspeople and designers—meet, their interest for co-design activities is bigger when there is an existing sense of belonging to a CoP.

Conclusions

This paper reports on the use of technology during the formation of a local CoP composed by designers and craftspeople, examining how they have used technology to cooperate in order to solve design challenges. We employed a three-phase qualitative research to gain a deep understanding of the community dynamics, and their collaboration process following the initial workshops. After conducting participant and staff interviews, and studying a 11 month time frame of WhatsApp group

interactions, we held a co-design session. Based on the narratives in the WhatsApp group and the evolution of the communication over time, we conclude that we are in a presence of a CoP where both craftspeople and designers are involved in the community formation. Table 2 presents a summary of our findings, as well as the insights we obtained, what the main source of the data was, and the themes of communication that were present in the Whatsapp group and relate to each insight. This section discusses the steps an organization such as SH could take from the point of this study on, the implications of the study when compared to the literature, and presents the limitations of our study, as well as directions of future research.

Opportunities to Improve Collaboration Support

Research on collaboration in design teams and product development usually focuses on the people and processes rather than on the role of technology (Banker et al., 2006). Understanding the characteristics of collaborative work between small

manufacturers and designers, and leveraging requirements based on these previous findings, are essential steps in a process of designing or redesigning a service that supports collaboration in a community of practice. Even if there are systems on the market that could be used for short-term collaboration (e.g., WhatsApp), our findings identify opportunities and challenges related to the design and implementation of a more personalized collaborative system that fulfills the needs of the users as individuals and community members in the context of designer and craftsperson, that adapts to the real dynamics of a CoP. As digital transformation goes far beyond technology implementation, it is relevant to understand the digital maturity of each small manufacturing business in order to build on existing capabilities, particularly the genuine interest in technology of the business owner and their actual behavior. The boundaries between our personal and professional life are blurring; furthermore, if a small business owner is a mobile heavy user and uses mobile communication on a daily basis, this factor will enable a smoother digital transformation journey. We strongly recommend practitioners and researchers to address digital transformation for traditional industries by (a) first understanding the digital maturity level of the different participant groups, (b) observing what current practices they already have in terms of using technology for personal and business purposes, (c) identifying gaps that need to be filled in before introducing new solutions and (d) connecting their short term practical needs with the expertise they need to be developing in order to make their business grow in time. Essentially, the process has to make sense and connect with their immediate business needs: capture new clients (or survive in a hostile context), help them reach new suppliers (as was the situation of our designers) and design new products based on identified needs on the market.

Discussion of Implications

Our research is consistent with literature on instant messaging within communities of practice. Recent research on instant messaging communications shows that this type of tool tends to allow topic-oriented conversations rather than project-related ones (Costa-Silva et al., 2022). In the case of our CoP, we found instant messaging to be limited for certain uses. For example, for activities and events to gain traction, the CoP coordinator had to create events and ask members to confirm their assistance through Facebook, as it had better support for this type of activity. An instant messaging tool such as Whatsapp also does not support knowledge creation over time, which is one of the main components of a

CoP. However, the tool was used consistently and successfully, helping maintain post-workshop interactions active, for example, by sharing specific information and answering technical questions.

By the time SH community was created, as well as when this research was performed, WhatsApp did not yet have community management features, beyond being a linear instant messaging application. As of November of 2022, WhatsApp launched a new feature called Communities, allowing administrators to create and manage several chat groups together. As this is a new tool, further research needs to be done in order to validate if this type of tool better supports the management of a CoP.

Despite WhatsApp being an easy to access technology already in use by the community members, in time, one standalone instant messaging chat group tends to generate an overwhelming amount of conversations. This growing quantity of topics and notifications makes it difficult to keep up with different topics and conversations. These findings are consistent with similar research on online group chat (Pasad et al., 2020). In our CoP, the temporary solution was to create specific WhatsApp groups to address specific topics. Nevertheless, this practice tends to become limited and time-consuming for the coordinator.

Finally, none of these online tools replace face to face interactions when it comes to creating long term commitment and sustainability of the CoP.

Limitations and Future Research Opportunities

As the Whatsapp group was still active at the time of the study, it is unclear what would happen to the group if the coordinator left. Their role was of a group facilitator (similar to studies such as (Downing et al., 2017)), and according to our results, they play a role in keeping the community active—for example, the highest number of statements was sent by the coordinator, they also provided most of the opportunities and created groups for specific projects. However, our study does not provide insights into how a self-sustaining CoP with no facilitator is formed.

Future work will consider designing, deploying and evaluating a prototype for this community of designers and small manufacturers. Moreover, future research could address the impact of different participant characters in the communication in the CoP during activities such as workshops, and in follow-up interactions, for example, in innovation projects, and collaborative business opportunities.

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