

Towards a Pattern Language for improving UX work in Software Startups

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Software startups are endeavors focused on building innovative products by seeking to achieve a high growth rate. However, there are a large number of startups that fail in their venture. Software startup failures are often associated with a high degree of market uncertainty, limited resources, time pressure, or simply a bad product idea. User experience practices can help startups achieve successful and sustainable business creation, promoting genuine interest from users, and opportunities for meaningful feedback. To encourage startup professionals to incorporate UX into their practices as earlier as possible, we present in this paper five patterns entitled: UX WORK VALUE, SHARED UX MINDSET, UX WORK DRIVEN BY USER DATA, KNOWLEDGE OF REAL USERS, and RECORD OF UX WORK. These patterns are part of a larger set of patterns that have been identified through empirical studies that we have carried out in four software startups. In our pattern mining process, we followed an inductive approach using elements of Constructivist Ground Theory by investigating emerging issues concerning UX work in software startups.

CCS Concepts: • **Software and its engineering**; • **Software creation and management**;

Additional Key Words and Phrases: software startups, user experience, UX work, UX patterns

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1 INTRODUCTION

Software startups play an important role in global economic development by stimulating innovation and job creation [12] [29]. Looking for scalable, repeatable, profitable business models [3], software startups emerge with the aim of creating cutting-edge products and fast growth. However, software startups often faced conditions of extreme uncertainty and limited resources before achieving a product-market fit [35] [30]. Although there is no consensus on the definition of a software startup, many share an understanding that software startups are unique in dealing with uncertain conditions, quick growth, innovative products, and scalability [35] [19]. Nevertheless,

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we agree with those who argue that the combination of innovation and market-driven contexts is a key aspect of characterizing startups and distinguishing them from established companies [25] [27].

User experience (UX) has been identified as a key aspect of leveraging greater value for the startup business while meeting customer needs and reducing wasted time and resources [17] [32] [14]. The ISO-9241 norm [7] defines UX as “*user’s perceptions and responses that result from the use and/or anticipated use of a system, product or service*”, emphasizing human-centered design practices, such as user research, interactive design, user involvement, and cross-functional design teams. In this way, UX work can help startups to move towards successful and sustainable business creation, promoting genuine interest from users, and opportunities for meaningful feedback [35].

In this paper, we present the five patterns to encourage UX activities and practices in software startups as early as possible, considering the challenges professionals face from the early stage to the growth stage. The target audience for these patterns is entrepreneurs and professionals working in product development in software startups interested in incorporating UX work into their practices. It is worth noting that the issues addressed in the proposed patterns could be found even in companies in general. However, our unit of analysis in this study has especially been for software startups to fill a research gap on how UX work has been developed in such companies and what challenges they face in putting it into practice. Our patterns address aspects that are inherent to software startups. Therefore, we believe that further research would be needed to extend these patterns to companies in general. In the following sections, we present the background and related work, and an overview of the proposed patterns. Then, we describe the patterns in detail.

2 BACKGROUND AND RELATED WORK

Earlier studies point out that the rapid evolution of startups could be adding extra complexity to software engineering, suggesting that startups should be more structured in following the best engineering practices [19] [25]. There has been considerable research relating to managerial strategies [30] [13] and good engineering and design practices applied in software startups [24] [21] [33]. For instance, Klotins et al. [21] mapped goals, challenges, and practices from an analysis of 88 startups reports and created a progression model to guide software engineering efforts covering six process areas (i.e., team, requirements engineering, value, quality assurance, architecture and design, and project management). From that study’s findings, Klotins et al. [20] identified three antipatterns that can hamper the evolution of startup businesses which are rooted in engineering inadequacies, leading to different consequences: (1) not getting the first product release out, (2) not attracting customers to the product, and (3) challenges of scaling the product for new markets.

Other studies of patterns for software startups, focus on describing the challenges in the early stages concerning organizational issues [9], human resources [23], and management aspects [28] [22]; others focus on product development strategies [8], technical issues [26], and teams’ dynamics [10]. However, there are few patterns addressing UX work in software startups so far [16] [22]. Leppanen et al. [22] identified a set of patterns by carrying out an empirical study on general working practices in 18 software startups in Finlandia and Switzerland. In their study, the observed practices were grouped into 11 categories: business goal, culture, funding, customer, organization, competence, team, process, design, testing, and technology. To foster real users involvement in product development and business idea validation, Hokkanen and Leppanen [16] proposed three patterns called ONLY REAL USERS, MEANINGFUL USER FEEDBACK, and HAPPY TEST USERS.

We investigated in the literature how software startups work with UX and its relationship with software development practices. Saad et al.’s work, we identified the main reasons for startups not to adopt UX, which are related to (i) lack of knowledge about what UX means and its value to the business, (ii) difficulties in selecting UX practices and techniques that can bring valuable information to them, and (iii) knowing how to handle user data to inform design decisions [32]. Additionally, this study revealed some open questions such as “How can

startups’ needs about UX be related to their users’ demands?” and “What are the best UX practices to be applied in the context of startups?”.

To explore questions like these, we also conducted a survey with 88 software practitioners from Brazilian startups investigating a wide range of UX-related issues [34]. Our survey focused on exploring the main UX practices adopted, skills considered essential to perform UX activities, on the adoption of UX work in software development phases, and the main factors that can influence UX work in software startups. Our findings revealed that the creation of successful products associated with the creation of value for both users and the startup business are the main triggers for the adoption of UX practices. However, it may be challenging for startup professionals to carry out UX work due to the need to react quickly to market demands by strategically balancing the trade-offs between meeting business goals and user needs. Moreover, the lack of consensus on UX relevance is a factor that can hamper UX work.

3 UX-RELATED PATTERNS FOR SOFTWARE STARTUPS

3.1 Patterns mining

The discovery of the patterns presented in this paper is one part of a larger research project that investigates the UX work in software startups. The studies by Saad et al. [32] and da Silveira et al. [34] mentioned in the previous section are preliminary results of this research. The five patterns presented in this paper are part of a collection of 14 candidate patterns, which were identified through an in-depth study we carried out at four software startups located in Sorocaba, São Paulo, Brazil. According to Startup Genome’s report [11], Brazilian startups raised a record-setting \$2.7 billion in the second quarter of 2021. São Paulo state has a robust startup ecosystem with an extensive network of public and private research institutions, as well as technological park systems located in different cities of the state. In Sorocaba, a city with more than 600 thousand habitants, the startup ecosystem has grown in recent years. We chose to carry out our studies in Sorocaba because we already had a pre-established network with the startups. For ethical reasons, the names of the products and companies are omitted. We refer to the startups as A, B, C, and D. All startups are more than five years old, with a functional product, and an established customer base, but at different levels of maturity in relation to UX work. Table 1 summarizes the main characteristics of the studied startups.

Table 1. Overview of startups characteristics

Startups ID	A	B	C	D
Startup age	5 years	6 years	5 years	8 years
# Employees	80	70	12	800
Market segment	Education	e-Sport	IoT	Logistic
Business Model	B2B	B2C	B2B	B2B2C
# customers/users	250+ schools	180,000 users	30 companies	40,000 users

We collected data from semi-structured interviews with 28 professionals of the startups with different backgrounds and expertise; for instance, product designers, UX experts, design leads, customer experience, developers, product owners, marketing, and others. Startups were not required to have UX experts. Furthermore, we conducted evidence-based timeline retrospective meetings [2] as methodological triangulation of data at startups A, B, and C. Each interview lasted 30 to 96 minutes, while the retrospective meetings lasted around two hours. A proposal for this study was previously reviewed and approved by the Ethics Committee in Brazil (CAAE: 29367020.0.0000.504) at the Federal University of São Carlos, Brazil. All data collection activities were conducted online using Google Meet. At least two researchers participated in the interviews and retrospective meetings,

leading the meetings and taking notes. The meetings were recorded in video with the prior consent of the participants and transcribed for analysis. Data collection and analysis were performed in two rounds, as described below.

In the first round, we collected data with 5 professionals from startup A and 11 professionals from startup B. The collection activities (interviews and retrospective meetings) took a place from August to October 2020. For data analysis, we applied the Constructivist Ground Theory approach proposed by Charmaz [5] with three coding steps (i.e., initial coding, focused coding, and theoretical coding). In total, 619 minutes of video recordings were transcribed and analyzed. As a result, we identified 14 UX-related needs which emerged from the daily practices used for software development in the two startups. Subsequently, these findings were validated with both startups through member checking sessions [18]. Considering the 14 UX-related needs identified and refined over the course of the three coding steps, we carried out a two-day workshop (8 hours) involving all authors of this paper to draft the pattern candidates, adopting a writing style based on [1]. During the workshop, the researchers elaborated 14 UX-related patterns candidates with name, context, problem, and forces. We did not find enough evidence to outline solutions for each pattern, since these were identified from issues still unresolved in startups A and B. To achieve possible solutions for these problems, we collected further data from two other startups, with different characteristics from the previous ones, e.g., number of employees, market segment, business model, and level of UX maturity.

In the second round, we conducted the data collection with 5 professionals from startup C and 6 professionals from startup D. The collection activities took place from April to September 2021. We followed the same data collection procedures used in the previous studies and gathered additional data on the 14 UX-related needs identified earlier. In this round, 758 minutes of video recordings were transcribed and analyzed using initial coding and focused coding. Then, the findings were used to refine the 14 patterns and add solutions, consequences, and examples. A list of all the patterns is included in the Appendix.

3.2 Patterns overview

As mentioned earlier, in this paper, we present 5 of the 14 UX-related patterns identified from an empirical study carried out in the four software startups. Figure 1 presents an overview of the patterns and their relationships. Categorized by UX practices and methods, the five patterns are detailed in Sections 5 to 8. We adopted a pattern-writing based on Alexander's style [1]. The pattern's name is presented in the section's title followed by its aliases. The motivation for using the pattern and the context for applying it are described in the first and second paragraphs of each section respectively. Next, the problem to be solved by the pattern is highlighted in bold. The forces of the pattern are listed with bullet points. The solution statement is also presented in bold right after the word "therefore". Then, we provide a description of the pattern application, the positive and negative consequences of its application, and some examples of using the pattern are highlighted in italic. Finally, we present the related patterns. A summary of the five patterns containing a brief description of each of them is presented below.

- (1) **UX WORK VALUE**: how to highlight/show the value of UX by outlining a UX strategy and defining goals so they can assess the UX work along the way.
- (2) **SHARED UX MINDSET**: how to promote the UX culture by educating the startup practitioners about UX concepts and user-centered design foundations, pointing out UX benefits, and disseminating the results of the UX work.
- (3) **UX WORK DRIVEN BY USER DATA**: how to respond to user demands, when startups professionals need to analyze user feedback before deciding to incorporate any changes.

- (4) **KNOWLEDGE OF REAL USERS:** how to get knowledge about the demand and acceptance of the product by conducting research and evaluation of the product with real end-users.
- (5) **RECORD OF UX WORK:** how to document of UX artifacts and decisions by keeping simple documentation, up-to-date, and in a centralized place, and making it accessible for all when they need it.

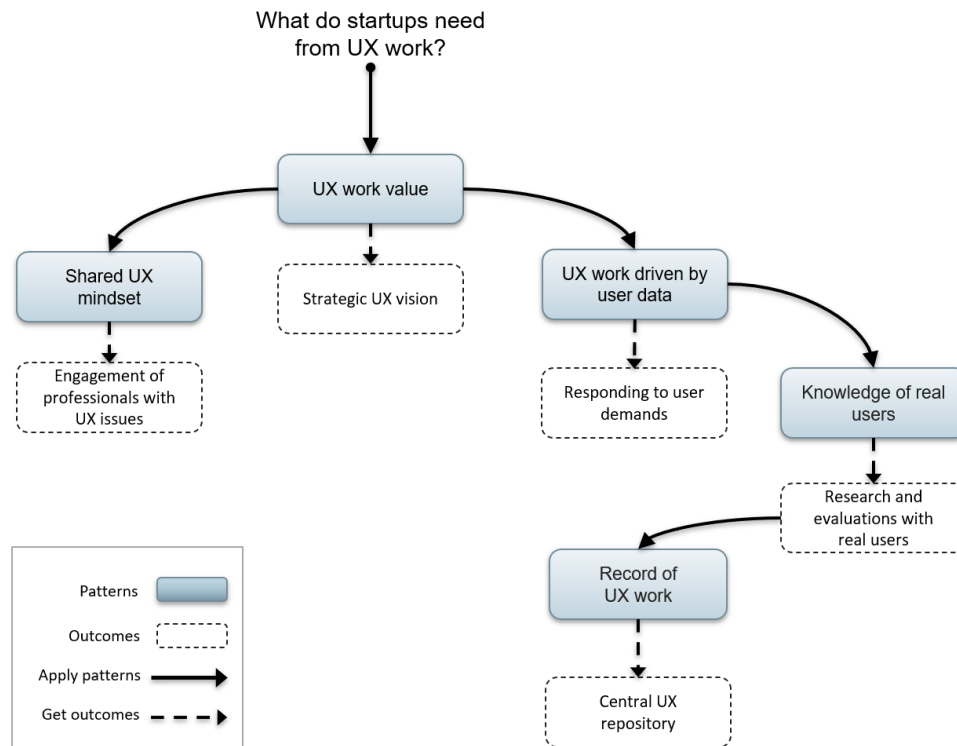


Fig. 1. Overview of the patterns and their relationships.

By answering “*what do startups need from UX work?*”, we found that a key aspect to conducting UX work and building successful products is understanding the **UX WORK VALUE**. Maybe some startup professionals do not understand how UX work can generate value for the user and for the business at the same time. Then, a manner to understand the value of UX is to establish a *strategic UX vision* that considers a balance between user needs and business objectives. Thus, startup professionals need to recognize the value that UX can bring to the startup’s products and services. In this sense, **SHARED UX MINDSET** can be crucial to the success of UX work. We found that the involvement and *engagement of professionals with UX issues* is one way to achieve this understanding. **UX WORK VALUE** is also important for **RESPONDING TO USER DEMANDS**. Many software startups tend to follow a customer-centric philosophy [4]. In the investigated startups, **RESPONDING TO USER DEMANDS** as quickly as possible is one of the main concerns. Not all user demands are related to UX issues. However, UX-related issues are taken care of with a view to offering a *good UX*. A good UX means providing a clear pathway to help the user achieve their goals when interacting with the product. A good UX solution can be achieved through **KNOWLEDGE OF REAL USERS** using different UX techniques and methods. UX work is crucial to understanding user behavior

and constraints and identifying pain points. UX activities result in several *UX artifacts and decisions*. However, DOCUMENTING ARTIFACTS AND DECISIONS can be challenging for startup professionals. Our findings revealed that practitioners want to keep this documentation as organized and accessible as possible. One solution to this issue is to create a *central UX repository*. In the next sections, we describe the patterns in detail.

4 UX WORK VALUE

Also known as Showing UX Value, Highlight the Value of UX, Understanding the Value of UX

To survive within the highly competitive market, software startups need to develop innovative and disruptive ideas, focusing on value propositions that meet the desires of their customers. In this way, startups face many uncertainties in the market, regarding product features and financial resources. In the beginning, they have few resources to spend on essential tasks, and often the UX work is not on the task list. The team is small, and the organization still does not have a consolidated cultural base regarding how much UX can add value to users and bring a differential for the business. Often, startups do not prioritize the UX process and do not understand how it can benefit them right away.

So, the problem is how to highlight/show the value of UX?

- Historically startups start their operation process by prioritizing the technology team and often they cannot recognize the UX benefits to the startup business from the early stages.
- The uncertainties and lack of resources affect the UX work but positive experiences should keep a user loyal to their products and services.
- The returns on investment in UX work may not show up right away but customer satisfaction is essential for business success.
- User research and design activities can be costly and time-consuming but wrong design decisions can cost you much more.

Therefore:

To understand the value of UX, the startup team needs to outline a UX strategy and define goals so they can assess the UX work along the way.

UX work can give competitive advantage by creating value both from the point of view of business interests and user satisfaction. However, finding the best way to conduct UX work to meet business interests and fulfill the user's needs in a balanced way can be challenging. In the beginning, the UX goals can be modest and the deliverables granular. As the startup gains maturity in its processes and more knowledge of the target market, the UX goals need to be updated. As encompassing both tangible and intangible aspects, UX value may not be so easy to measure. However, to get an idea of the added value, professionals can track the increase in sales, customer satisfaction, and the increase in brand loyalty.

As a consequence, teams recognize that the main value of UX is saving time in developing a solution that will really please the target audience. In addition, professionals may notice a decrease in development costs due to UX work. Defining a UX strategy can lead professionals to increase collaboration and improve the alignment of startup' teams to meet user needs. On the other hand, despite understanding the value of UX, professionals may neglect UX issues when other pressures imposed on product development are considered to be more important.

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In startups A and C, there are no UX-dedicated roles, teams are aware that UX is important, but they don't have access to methods, resources, or organizational support to incorporate UX work routinely in their processes. In startup B, there are people in UX roles who are still working to prove the value and impact of UX. UX is still not prioritized as a strategy in the startup, and professionals recognize that lack of alignment between teams hinders UX work. At startup D, UX work has been institutionalized longer and has full support from the board. UX goals are established every quarter and are aligned with the startup's OKRs.

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UNIQUE VALUE PROPOSITION and FIND YOUR VALUES [8] focus on differentiating the startup business in the market and reflecting the startup values making people involved look in the same way. USE PLANNING TOOLS THAT SHOW VALUE PROVIDED TO CUSTOMER [8] helps to show as the customer's needs are in line with business goals. UX WORK DRIVEN BY USER DATA and SHARED UX MINDSET are also related patterns.

5 SHARED UX MINDSET

Also known as Educating for UX, Creating UX Mindset, Promoting UX Culture

Few startups are able to embrace UX work from day one. In the beginning, the team is small and the professionals work on several fronts, accumulating roles to achieve a functional and more stable version of the product. Most of them do not know what UX really means and are unaware of how a good UX can provide value to users and their businesses. Many startups only introduce UX work later, when they reach a certain revenue or acquire more funding. A premise for successful UX work is the buy-in of all the company's professionals. UX principles and a user-centric mindset need to be part of the company's strategy.

So, the problem is how to promote the UX culture in a startup?

- UX can help them design experiences that satisfy customers but the startup team may not have the knowledge or skills to contribute to UX work.
- Later, with more funding, UX practitioners are hired but the technology team and professionals in other areas cannot see value in UX work.
- There are several UX methods and practices can be applied but teams (including startup founders) do not have a clear understanding of the design process as a whole.

Therefore:

Educate the startup practitioners about the UX concepts and user-centered design foundations, highlight the UX benefits, and report the results of the UX work.

As the startup grows, it needs to define better its processes to gain speed and ensure the quality of its products and services. UX professionals are responsible for helping the startup adopt a more user-centric approach. On the other hand, professionals from other areas need to have a common vision of the benefits that UX work can bring to user target satisfaction and business goals. To promote UX culture in the startup, organize design workshops and training on UX topics, and seek to formalize and define the UX practices. To show UX value, share design decisions and evidence of positive results through a UX report. Regardless of their role, encourage practitioners to make suggestions and provide UX-based insights to improve the product. And, take regular meetings between teams and work groups to discuss UX issues and improvement points.

As a consequence, engaging professionals in UX activities and sharing UX findings helps show that conducting user research and any other UX activity is worth the investment despite the effort. Formalizing and defining UX

practices helps professionals become familiar with the UX process. On the other hand, given the highly dynamic nature of the startups, it can be challenging to find room on the agenda to do workshops with teams from other areas. Because culture is not established overnight, UX professionals may have to show work results and promote them internally for a long time.

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In startup B, the UX maturity level is still very low and UX professionals still have a lot of work to do to make clear the importance of UX for the entire company. UX professionals recognize the importance of acting as evangelists and facilitators of UX work, as the design team is still very small. Involving professionals in design workshops was a way they found to engage professionals and spread the UX culture. Many professionals today value UX work more and understand the importance of conducting user research, for example. Another key point was when they present the results of a UX project to the entire company. IN startup D, design is recognized as an extremely important competence for the business and a market differential focused on innovation. However professionals still struggle to deliver the full potential of UX work within very tight deadlines. To promote UX culture within the company, the design team holds monthly open meetings that they call a “book club”. In this meeting, a book in the area of design or not is suggested and the participants discuss chapters of the book from a practical point of view, mixing with the experiences of each one.

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USING PROVEN UX METHODS [22] also extends to using practices that help share understanding within the company and spread UX knowledge. DEVELOP THE DEVELOPMENT CULTURE BEFORE PROCESSES [8] encourages people to learn new things and develop their practices. SHARING COMPETENCE IN A TEAM [8] means sharing skills and knowledge about how things should be done and how to do it better.

6 UX WORK DRIVEN BY USER DATA

Also known as Reactive to Users’ Demands, Responding to Users’ Demands

Many software startups recognize the importance of having a customer-centric business model as an efficient way to increase sales and revenue. The customer-centric mindset implies listening to the customers/users and seeking to offer positive experiences through interaction with your products and services. By establishing different channels of communication with their customers/users, startups can find out how satisfied they are with their products and services and also how they can best meet their needs. There are numerous tools startups can leverage to collect user feedback (e.g., web surveys, Discord, Slack, chat). Within a very dynamic market, a commitment to listening to customers/users leads startups to be reactive and respond to their expectations as quickly as soon. Most software startups have limited resources, and often do not have enough human resources to deal with the great number of users’ requests that it receives.

So, the problem is how to respond to user demands?

- Startups receive a lot of requests and suggestions from users through different communication channels.
- Many times, customers complain about recurring problems that require an urgent solution but there is a list of issues to resolve before, including the release of new features.
- Some issues are complex to solve due to technical constraints or rely on third-parties technologies and services.
- Some requested changes may not add value for the vast majority of users or may be outside the startup’s business model scope.

Therefore:

Professionals need to analyze customer and user demands before deciding to incorporate any changes.

Filters and analyse the users' and customers' requests before they come to the development team. The startups can designate a group of professionals with different skills to be responsible for filtering the requests and forward them to the responsible teams. During the team ceremonies (e.g., daily meetings) the startup's professionals can analyse, discuss and prioritize the users' requests that can be solved by them. Artefacts such as Kanban boards can be used to communicate to all the team the users' requests that they are dealing with.

As a consequence, using feedback collected from customer service can be a great opportunity for the team to identify the pain points, get insights for UX improvement, and act on them. But analyzing all users' demands and prioritizing them may not be an easy task, especially when the customer base is very large, there are many channels of communication with users, and information is scattered. Furthermore, dealing with customer complaints can be exhausting and cause frustration for the team, especially when the team is unable to fulfill users' expectations satisfactorily.

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In the four investigated startups, we found people or departments specialized in serving customers (e.g., Customer Experience, Customer Success, or Customer Loyalty), the received requests and complaints are managed and a pre-screening of demands is carried out. Startup D highlights that, as a customer-centric company, every investment they make is focused on solving their customers' pain. The company receives many calls, many complaints, and many service tickets are opened daily. On the other hand, product development is driven by OKRs (Objectives and Key Results), and teams are always committed to evolving the product. In this sense, the professionals who deal with the product (e.g., product owners and designers) cannot work just to solve the day-to-day problems, unless they are very serious issues. Therefore, they always need to assess users' demands, weighing the effort required and the value that will be generated. At startup A, they seek to solve the customer's problems as quickly as possible, but the time spent in solving depends on the complexity of each issue. There are some issues that depend on a third party and they have no control over the solution. At startup C, most product improvements are made to meet customer needs that are reported through customer service. Even so, they recognize that they need to manage such demands better, as they have many open issues due to a lack of planning to establish a roadmap for improvements. At startup D, the customer base is also very large, the product team cannot meet all demands. They argue that some demands are not met by technical constraints and others are outside the scope of the business. Due to the volume of calls and demands spread by several channels, they look for some kind of automation to help them analyze such demands more efficiently.

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KEEP CUSTOMER COMMUNICATIONS SIMPLE AND NATURAL [6] is a related pattern that encourages frequent contact with customers/users and mechanisms for automatic collection of feedback within the application to achieve insightful information. HELP CUSTOMERS CREATE A GREAT SHOWCASE FOR YOU WITH SUPPORT [6] highlights the need to serve the customer without losing the focus of the business. In this sense, FOCUS ON GOALS, WHYS pattern [6] refers to finding the real motivation and reasons behind customers' wishes before fulfilling any demand. In addition, KNOWLEDGE OF REAL USERS is a way to make better decisions regarding users' demands, and UX WORK VALUE helps to establish a strategic vision to guide UX work.

7 KNOWLEDGE OF REAL USERS

Also known as Getting Knowledge about Real Users, Conduct Product Discovery with Real Users

Many startup entrepreneurs recognize the importance of a good user experience for the success of their products and services. Having a clear view of real customer needs from the early stages of product development helps startups save resources and avoid rework. Startup professionals can be more proactive in seeking to understand users' needs in advance of evolving their products and services or creating new ones; or even when they evaluate their products during development instead of leaving to evaluate until the end, when it may be too late. Understanding the impact of a product to the market, as well as gaining an understanding of end-users profiles, their needs, behaviors, goals, preferences, and pains is crucial for businesses success.

So, the problem is how to obtain knowledge to develop products and services with a good UX?

- When designing their products, many startups gather non-functional requirements from their customers but rarely investigate the real needs of end-users of the product.
- Startup professionals often test new features internally with startup members but rarely evaluate them with real users throughout product development.
- UX problems are usually identified after the product release but can be costly to win back the trust of a user who was disappointed with the product.
- Many resources can be wasted when problems are identified too late.

Therefore:

Conduct research and evaluation of the product with real end-users.

Research and evaluation with real users at different stages of development can reveal potential problems along the way that can be avoided or mitigated. Prototypes and interviews can be used to develop and test business ideas and validate market viability, mainly in the early stages. Surveys are useful to understand the behavior of a certain audience or to assess user satisfaction with new features. The results of user research and understanding are the value UX professionals can bring to the product by merging them with the company's objectives. Research type and focus can vary greatly depending on the context, team moment, or product stage. There are a myriad of UX techniques and methods that can be used, and professionals are free to choose the ones that are most convenient rather than following a rigid process.

As a consequence, the team can have many insights into how to improve the product when they look at user behavior to understand better their problems and pains. Also, they can prioritize issues that are most urgent and bring value to the customers. On the other hand, the team may not be able to listen to users in advance, due to a lack of resources and other project commitments. However, many of these issues can be hard and expensive to fix in later development stages if not noticed in time. The lack of user engagement for surveys can be a challenge for startup teams.

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In startups A and C, the development teams are small and none of them have UX professionals. However, some UX practices are performed in an ad-hoc manner. At startup A, customer surveys are conducted by the marketing team when they want to measure the impact of new features. They use high-fidelity prototypes to validate ideas with customers, but they don't test with real users throughout product development. Professionals recognize that many problems that appear after launch could be avoided through testing with real users. At startup C, the founders are informally involved in user research to discover users' needs, however, these initiatives are still timid and inefficient.

With a new round of funding, they plan to outsource the UX design to get a more attractive product. At startup B, the UX work is carried out by two UX experts who are newly hired; they don't follow any defined UX process. Currently, they are allocated within the teams and develop research and evaluation with users according to the demands of the project. Sometimes UX professionals ask the marketing team for help to engage users in their surveys. They also take advantage of the startup's gaming championships to evaluate the product and collect feedback from real users. Startup D has a large team of designers with 34 professionals. UX work is led by UX strategists and product designers. Both roles conduct user research and evaluation, but with different purposes. UX strategists deal with discovery, exploratory research, and more qualitative research. Typically, they conduct more interviews and exploratory data analysis to understand the market and user segments. Product designers are more concerned with users who are already using the product, so they conduct research to understand customer pain points, seeking to identify what works well and what can be improved.

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USE PROVEN UX METHODS [22] is a related pattern that recommends Goal-Directed Design, suitable UX methods, and skilled developers to build successful products from the start. DESIGN AND CONDUCT EXPERIMENTS TO FIND OUT ABOUT USER PREFERENCES and USE TOOLS TO COLLECT DATA ABOUT USER BEHAVIOR [22] can be applied when the team needs to know quickly in which directions your product should develop to attract more users and justify larger investments (e.g., test A/B and Google Analytics). Finally, RECORD OF UX WORK generated in UX activities facilitate the sharing of knowledge about the product.

8 RECORD OF UX WORK

Also known as UX Documentation Accessible, UX Research Repository

Operating in uncertain markets and with limited resources, startups need more flexible work practices rather than more structured and rigid processes to evolve quickly. Mainly, in the early stages, startups having a small team tend to adopt simpler and more informal workflows to speed up the product development process that normally undergoes constant change until it reaches its most stable version. As they are highly reactive, startups tend to release product versions very quickly. Product design activities generate different types of artifacts such as flows, wireframes, prototypes, information about users and their needs, design decisions, and implementation details, among others.

So, the problem is how to keep documentation of UX artifacts and decisions?

- Startup professionals need to move quickly to adapt their products to the needs of the target audience so product versions are released very quickly.
- Many design decisions are made at each step and to inform their decisions, startup professionals need to collect information about users, their needs, and motivations using user research techniques.
- Many user data is generated and various design artifacts are produced throughout the process but there is no single place to store them.

Therefore:

Keep UX documentation simple, up-to-date, and in a centralized place, and make it accessible for all when they need it.

Documenting UX design artifacts and decisions is important to keep a team aligned to business goals and understand the decisions that were taken to market fit. Different tools can be used to store documentation such

as prototype links, recordings of meeting, user research reports, and design decisions. Some tools such as Figma and Confluence help organize artifacts in project directories, making the search for UX documents quicker and more efficient. Proper documentation makes it easy for anyone to understand the design decisions and explore what was done earlier.

As a consequence, structured UX documentation lessens the effort of newcomers in learning about the product’s evolution and understanding the motivations/context behind the changes. However, due to time-to-market pressure and the high pace of change the product undergoes, it becomes difficult to documentat UX deliverables in a structured way.

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Overall, professionals tend to document poorly even in mature startups. They argue that documentation sometimes ends up holding them back by slowing down the speed at which they can deliver and move forward with product development. Startup B’s UX expert comments that there is a lot of documentation that should be done, but they do not have time to do it: “The startup is a business environment that changes very quickly, some changes are kind of done in a hurry, and not even the files from the original screen are up to date”. Some artifacts are stored in the tools where they are created, for example, Figma, Miró, Notion, etc. Conversations between teams and users about design decisions are stored in communication tools, e.g. Slack and Discord. To understand why certain decisions were made, designers need to talk to many people to obtain information that many times are only in their heads. In startup D, documentation is also a problem because it is not stored in a structured way. Recently, professionals started linking all artifacts produced with project tasks using Jira and Confluence. With this good practice, professionals make life easier for newcomers and other stakeholders that need to access any information about the project.

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To keep UX documentation accessible, startups teams can apply the `CENTRAL UX REPOSITORY` pattern [31] to store general UX information or `UX SPECIFIC REPOSITORY` pattern [31] for UX-specific tasks. UX artifacts and decisions with a transversal impact on the project can be addressed by using the `UX CONCERN` pattern [31].

9 SUMMARY

In this paper, we presented five patterns of UX activities and practices for software startups. These patterns are part of a larger set of patterns that were identified in an empirical study conducted with 23 professionals from four software startups. Our main goal is to encourage startup software professionals to incorporate UX work into their processes as early as possible. For future work, we intend to identify new patterns to extend our pattern language.

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APPENDIX

This appendix presents the 14 UX-related patterns for software startups in the form of patlets. A patlet is a brief description of a pattern, usually one or two sentences representing a problem-solution pair [15]. We break our UX-related patterns for startups into three categories: UX activities and practices (Table 2), Customer and user information (Table 3), and UX work and teams (Table 4).

Table 2. UX Activities and Practices

Pattern name	Description
UX WORK VALUE	To understand the value of UX, the startup team needs to outline a UX strategy and define goals so they can assess the UX work along the way.
SHARED UX MINDSET	To promote the UX culture at a startup, UX designers can educating the startup practitioners about the UX concepts and user-centered design foundations, highlight the UX benefits, and report the results of the UX work.
UX WORK DRIVEN BY USER DATA	To responding user demands, professionals need to analyze customer and user demands before deciding to incorporate any changes.
KNOWLEDGE OF REAL USERS	To obtain knowledge to develop products and services with a good UX, startup professionals need to conduct research and evaluation of the product with real end-users.
RECORD OF UX WORK	To properly keep UX artifacts and decisions documentation, startup professionals need to keep documentation simple, up-to-date, and in a centralized place, and make it accessible for all when they need it.

Table 3. Customer and user information

Pattern name	Description
DOCUMENT DEMANDS COMING FROM USERS	To manage demands coming from users, startup professionals need to choose a system to manage the users' demands. These systems are software programs that allow professionals to tag and assign users' demands using tickets as they come in.
BRING TOGETHER DIFFERENT SOURCES OF USER INFORMATION	To bring together user information, the startup team needs to implement a central repository that contains links to any artefacts reporting users' information. These artefacts can connect the information from different sources giving meaning to the information together, and avoiding duplicate information.
IDENTIFY REAL POINTS OF IMPROVEMENT THROUGH FEEDBACK	To identify real points of UX improvement, startup professionals need to gather user feedback (complaints and suggestions) within a single repository to make it easy to identify recurring UX issues. When identifying the main UX issues, the team needs to check if they have any technical or business restrictions that hinder its implementation.
IDENTIFY PROBLEMS THROUGH METRICS	To identify UX improvement points, startup professionals can track the actions of their users while they use the product or service by collecting usage data through the automated collection and establishing UX-related metrics according to what they want to discover.
IDENTIFY UX INSIGHTS FROM USER DATA	To make better UX decisions, the team needs to develop a culture of looking at this user data and considering it to identify information that is meaningful and actionable.

Table 4. UX work and teams

Pattern name	Description
IMPROVE COMMUNICATION BETWEEN TEAMS	To improve communication between teams, representatives from different teams can meet regularly to discuss product improvement and user experience issues and hold meetings with stakeholders to ensure the alignment of UX goals with the startup's business strategy.
UNDERSTAND HOW TO START DOING UX	To start doing UX, the startup team needs to establish a UX strategy according to the characteristics of the business model, available resources, and startup stage and periodically take time to think and talk about UX issues.
PROFESSIONAL INPUT ON UX	To have professional input on UX, the startup leads needs to designate professionals to conduct the UX work on a regular basis.
DEFINE ROLES AND JOBS DESCRIPTION FOR UX	To collaborate better with their co-workers, UX professionals need to know who does what and when. Defining UX roles and job descriptions is important so that UX professionals and their colleagues know what tasks each of them is responsible for.