Towards Understanding How Software Startups Deal with UX from Customer and User Information

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Abstract. Customer-centric strategies can help startups move towards successful and sustainable businesses. User eXperience (UX) has been considered a critical factor in creating value for the customers and users of startups. Software startups often collect data about the experience with the product from users. However, obtaining valuable insights to improve the UX from customer and user information can be challenging for startup professionals. In this paper, we present a multiple-case study conducted with Brazilian software startups in which we investigated how these companies deal with customer and user information. To collect data, we conducted semi-structured interviews and retrospective meetings with 28 professionals from the four startups. We found that the startups still need to improve their strategies to leverage customer and user information insights for continuous product improvement, including improving communication channels and adopting metrics to assess customer value creation and product success. As a result, this study can motivate startup professionals to reflect on the most efficient practices for collecting and managing UX information to improve their products and measure value creation.

Keywords: Software startups · Customer-centric development · User experience · Customer feedback · Value creation · Case study

1 Introduction

Nowadays, startups have drawn researchers' attention from different fields due to their critical role in the global economy [5]. As the key drivers of economic growth, startups contribute to economic dynamism by intensifying market competition, entrepreneurial behavior, and strategy focused on technological innovation [18]. *Startups* are broadly defined as human institutions aiming to deliver

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new products or services under extreme uncertainty [33]. Startups differ from established organizations in searching for a scalable, repeatable, and profitable business model [2].

Although startups operate in different areas, most are software producers or use software to manage their activities [6]. A startup should aim for growth by combining innovation, and market-driven development [22]. However, many startups go out of business even before reaching product-market fit [7]. Regardless of there is no consensus on the clear and distinct definition of a software startup [14], such companies are known for working under conditions of extreme uncertainty and suffering from a lack of resources [15]. Time pressure and no prior operating history are also challenging factors, especially when startups are dealing with disruptive technology [8,33].

Considering the challenges of innovation and market-driven development, understanding the customers and users is vital for software startups to reduce business risks [17]. Customer-centric activities such as getting to know the customer and creating solutions for their needs should contribute to value creation that can lead to business success [2,11]. However, startup teams struggle to engage users and leverage insightful customer information to improve their products and services [13,30]. Studies in this field revealed that feedback loops to customers are slow, and the process of gathering timely and continuous feedback is still challenging [29].

In the software startup context, researchers have tried to understand better the obstacles and challenges faced by startup professionals arguing the need for specific engineering practices [15,17]. Other studies have investigated customer and user-centered approaches by incorporating User Experience (UX) aspects to promote value creation for both customers and startup businesses [10,11]. Recently, Saad et al. [25] investigated UX work in software startups and found that startups have UX concerns related to user demands scarcely explored in the literature. For instance, they pointed out the following open questions: "How do startups gather user data even with a lack of resources?"; "How can UX work contribute to creating value?"; "How are informal UX practices related to the difficulty in engaging users?"; and "How can users' data from different sources provide insightful information for product improvement?".

Taking into account the challenges and gaps mentioned above, in this study, we formulated the following research question: *How do software startups deal with UX from customer and user information to improve their products*? To answer this question, we qualitatively explored data collected from four Brazilian software startups at different maturity levels regarding the use of UX practices and methods. Unlike studies that investigate UX practices mainly in the early stages [8,9], we investigated startups with already stable products and an established customer base. By answering our question, we intended to identify software startups' primary customer and user information sources, including the main touchpoints, communication channels, methods, and tools. In addition, we investigated the main issues software startup professionals face in collecting and using this information.

The contribution of this paper is to show four cases and describe what they do on the perceived UX issues from customer and user information. In addition to identifying the main touchpoints, we categorized the types of customer and user information available in the studied startups. This categorization can help startups grasp the focus of the information to decide which part of the UX design to use it. Furthermore, the results of this study can motivate software startup professionals to reflect on the most efficient practices for collecting and managing UX information to improve their products and measure value creation.

The rest of the paper is organized as follows: Sect. 2 presents the background and related work about customer and user information and approaches to customer value creation. Then, Sect. 3 describes our research methodology, and Sect. 4 presents the study findings. After that, in Sect. 5, we discuss the results by answering the research question and pointing out the threats to study validity. Finally, we conclude the paper in Sect. 6.

2 Background and Related Work

Customer Development [2] and Lean Startup [22] are customer-centric approaches proposed to help software startups in new business development. Both approaches emphasize developing and experimenting with real customers and users by gathering feedback and gauging interest in the product from the inception phases [3]. By knowing the customers' demands, startup professionals can achieve the product-market fit sooner, reducing the waste of time and resources [24]. The literature presents several methods for conducting continuous experimentation regarding the elicitation of qualitative and quantitative customer feedback – e.g., test A/B, analytics, landing pages, interviews, observation, prototyping, usage data, and support data [3,21].

Customer Experience (CX) and User Experience (UX) are other innovation-driven strategies for developing solutions focused on delivering a good user experience [27]. CX examines the whole customer journey and experiences across several systems, products, or services that a company offers across time [16]. UX involves designing the experience of a single interaction that a user has with a company to perform a task [20]. Despite dealing with different levels of interactions, both strategies put customers and users at the center of developing products and services to provide better experiences and value while increasing profits [27].

The customer journey can involve many touchpoints with the company. A *customer touchpoint* is any interaction point where companies and customers exchange information about their product, brand, business, or service using different channels [4]. These channels are where the interactions take place – e.g., phone, email, chat, social media, and website. Nowadays, customers interact with companies through countless touchpoints in multiple channels, resulting in more complex and difficult-to-manage customer journeys [12]. Based on customer interaction and feedback mechanisms observed in a multiple-case study, Sauvola et al. [29] introduced the 'customer touchpoint model' that provides an

overall understanding of the customer touchpoints and feedback data collection. Additionally, the authors highlighted some challenges to customer-centric software development, such as (1) a lack of systematic ways to collect, analyze and incorporate customer data into the product development process; (2) indirect access to end-users; (3) a lack of understanding of the reasons behind customer requirements; and (4) a lack of continuous validation with customers.

Value creation through UX practices has been pointed out as a differentiation strategy that can enable startups to minimize uncertainty, reach business value through differentiation, and expand and grow the customer base [10,11,32]. Customer value creation is the main reason startup professionals engage customers and users in the development process. However, few recognize that this is important to sustain the long-term business model as well [31]. While many user-centric approaches and methods are available to promote value creation, startups can face barriers to adopting them besides scarce resources, time pressure, and organizational culture [6,7]. Startup professionals also need to overcome issues related to the dispersion of customer and user information, lack of know-how in collecting and interpreting customer feedback and user data [11,31], and difficulty in identifying metrics to evaluate the customer value creation and product success [28].

3 Research Method

This study is part of a broader research project that explores how UX work has been applied in software startups. Acknowledging that UX includes "*all aspects of the interaction between the end-user and the company, its services, and its products*" [19], in this study, we report findings from empirical data on how startups deal with UX from customer and user information to improve their products. To achieve our research goal, we performed a multiple-case study following the guidelines recommended by Runeson and Höst [23].

Case Selection and Description. Our study involved four software startups located in Brazil. According to Startup Genome's report [5], Brazilian startups raised a record-setting $2.7 billion in the second quarter of 2021. The selected startups were more than five years old; their products were stable, their customer base was already established, and they had different maturity levels concerning UX work. For ethical reasons, the names of the products and companies are omitted. We refer to the startups as A, B, C, and D. 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. The study involved 28 startup professionals with different backgrounds and experiences. Table 1 presents an overview of the characteristics of startups and the roles of the participants. Our key contacts in each startup are underlined at the bottom of Table 1.

Table 1. Overview of startups characteristics and interviewees roles

Startups ID	A	B	C	D
Domain	Education	e-Sport	IoT	Logistic
Business Model	B2B	B2C	B2B	B2B2C
Foundation	2016	2015	2016	2013
# employees	80	70	11	800
# customers/users	250+ schools	180,000 users	30 companies	40,000 users
#participants in interviews	5	7	5	6
#participants in EBTR	5	6	6	–
Roles	P1 to P5	P6 to P16	P17 to P22	P23 to P28

Startup A: (P1) Technology Director; (P2) Customer Service; (P3) Full-stack Developer; (P4) Marketing; (P5) UI Designer. **Startup B:** (P6) Product Designer Manager; (P7) UX Designer-1; (P8) UX Designer-2; (P9) Front-end Developer; (P10) Product Designer-1; (P11) Product Designer-2; (P12) Product Designer-3; (P13) Product Designer-4; (P14) Social Media Analyst; (P15) Customer Experience (CX); (P16) Product Owner. **Startup C:** (P17) Chief Technology Officer (CTO)/Founder; (P18) Chief Executive Officer (CEO)/Founder; (P19) Costumer Success; (P20) Full Stack Developer-1; (P21) Full Stack Developer-2; (P23) Geophonist (specialist in diagnosing noises) **Startup D:** (P24) Designer Director; (P25) Content Designer; (P25) Design Lead-1; (P26) Product Designer; (P27) UX Strategist; (P28) Design Lead-2

Data Collection. For methodological triangulation in data collection [23], we conducted semi-structured interviews and applied the evidence-based timeline retrospective (EBTR) method [1]. EBTR is a method based on the idea of agile retrospective meetings to support software teams to reflect on their experiences throughout a project [1]. Software teams typically organize retrospective meetings to improve their processes.

All data collection activities were conducted online using Google Meet. At least two researchers participated in the interviews and EBTR meetings, leading the meetings and taking notes. We conducted individual interviews with 23 participants from startups A, B, C, and D (see Table 1). The interviews lasted from 30 to 96 min. During the interviews, we asked some semi-structured questions to obtain information on how UX work was performed in the startups under study. Some sample questions included: *"How is your day-to-day work, and what roles do you play?"; "Can you give us some examples of work demands that come to you?"; "What is the work process you follow?"; "What artifacts and tools do you use in your work?"; "Which professionals do you interact with?"; "Have you participated in UX design activities?"; "Who are the professionals who have contact with customers and users?"; "Do you have any suggestions to improve UX work in the company?"*. To complement the data collected in the interviews and clarify issues regarding UX work performed over time, we conducted 3 EBTR meetings involving 17 professionals from startups A, B, and C (see Table 1). The EBTR meetings lasted around two hours in each startup.

Data Analysis. The data analyzed included approximately 23 h of transcripts from interviews and EBTR meetings, researchers' notes, and information about

the visual timelines and reflection boards produced during the EBTR meetings. We analyzed the data gathered following a qualitative approach based on open coding procedures with three rounds of refinement [26]. To explore the data for this study, we filtered codes related to existing touchpoints, communication channels with customers and users, type of information collected, methods and tools, and any activity involving customers and users. Additionally, we extracted statements from interviewees about issues related to collecting and using customer and user information.

4 Findings

This section presents findings for each startup related to customer and user information by exploring the existing channels, touchpoints, and how practitioners handle such information, including methods and tools. As mentioned, the findings of each startup are presented with quotes taken from the transcripts that related the participants to them (see in Table 1 the participants' identification). We underline the main chunks of text that represent findings to answer our research question. Table 2 summarizes the main findings about customer and user information found in each studied startup. As shown in this table, in addition to identifying the main touchpoints, channels, methods, and tools, we identified different customer and user information. To support our analysis, we categorized the identified customer and user information into four types, i.e., demands, feedback, usage data, and user profile, which we describe as follows:

- *Demands* refers to user requests involving bug and incident reporting, issues impacting users' experience, and suggestions for new features.
- *Feedback* refers to formal or informal information collected about reactions to a product or users' performance when performing a task, user requirements, and needs which are used as a basis for improving the product or service.
- *Usage data* refers to data on usage and user interaction with the product that can be automatically collected using, for example, experiments such A/B tests, analytics, and leading pages.
- *User profile* refers to actual customer and user behavior data, including demographic characteristics collected through different techniques, such as surveys, personas, and brand personas.

Startup A. At startup A, we carried out interviews and an EBTR meeting involving five professionals from the technology, customer service, and marketing areas. The tech team, in particular, is small (approx. 10), and they did not have UX experts when we collected data. The startup's business model is mostly Business to Business (B2B). Operating in the education and robotics market segment, startup As customers are mainly preschools, elementary, and high schools. Initially, they did not have direct contact with students, only with the school managers and teachers. However, due to the COVID-19 pandemic, they quickly adapted their products, to have contact with parents and students.

Table 2. Summarizing findings about customer and user information.

ID	Touchpoints, channels, methods and tools	Issues about customer and user information
A	*Touchpoints*: customers' loyalty team, marketing team, pedagogical team, sales team. *Channels*: email, messaging app, visit to the customer. *Methods and tools*: ticketing system, surveys, interviews, market studies, prototypes, log file analysis, and customer service indicators.	I1 - Startup professionals collect the number of accesses and control users' requests but the measurements are not done systematically. I2 - Although professionals use service indicators to improve their products, they often do not perform evaluations and testing with real users.
B	*Touchpoints*: CX team, marketing team, product and UX team. *Channels*: chat, email, and social media (e.g., Discord, Twitter, Facebook, Instagram, and YouTube), community channel. *Methods and tools*: ticketing system, automated measurements, brand personas, marketing tools, surveys, interviews, prototypes, empathy maps, personas, and usability testing.	I3 - Startup professionals collect some metrics of business but still do not take automated measurements focused on continuous product improvement or quality of user experience. I4 - They receive a lot of customer feedback from social media platforms, however, the technology team still struggles to leverage insightful information from these platforms to improve their products.
C	*Touchpoints*: customer success and founders (marketing and sales). *Channels*: calls, messaging app, and visit to the customer. *Methods and tools*: ticketing system, informal interviews (e.g., having coffee with the customer), and prototypes.	I5 - Startup professionals struggle to identify needs that meet and please as many users as possible. I6 - They recognize the need for mechanisms to monitor user data, manage their tasks, and implement a product improvement roadmap. I7 - They conduct unstructured customer interviews and develop prototypes on an ad hoc basis to gather requirements or validate ideas.
D	*Touchpoints*: marketing, sales, CX, product design teams (e.g., UX strategists, product designers, and brand designers). *Channels*: customer service calls, messaging app, and visit to the customer and users. *Methods and tools*: ticketing system, interviews, surveys, user testing, dashboard with metrics and indicators, user data collected automatically from experiments like A/B tests, and user behavior data using HotJar tool.	I8 - Design professionals argued that the collect of feedback need to be improved. I9 - To improve their contact with customers and users, they are mapping all touchpoints and improving their communication channels. I10 - Not all product teams collect information about user behavior.

This contact is mostly through the customer service team, also known as the customers' loyalty team.

As a result, they had to enhance the customer service structure to support a large number of users' demands: *"Now, we are assisting the parents of the students, which has become a very high demand"* (P2). At the time of the interviews, users' requests, feedback, and complaints were formalized via email and registered in a ticketing system that facilitated the management and follow-up of open issues forwarded to the teams responsible for resolving them. They also implemented online support for schools via a messaging app. Thus, the customer service sector is the primary touchpoint of customers and users (i.e., students and school staff) with the company, providing support for problems or questions related to the startup's software platform. Often, the customer service sector engages with users' pain points by forwarding their suggestions and ideas to developers for product improvement: *"People who usually give us these*

tips are the customer service team because they receive calls and questions [from users] that become a pain for them... so they talk to us 'ah, it would be great to have this feature"' (P3). Consequently, many improvements have been implemented by direct user suggestion or were identified through customer service indicators through which the team detects potential problems to be checked by the technology team. Sometimes, the technology team needs to analyze the log files to understand the usage issues (e.g., difficulty logging into the platform), so these customer service indicators are a basis for knowing what really needs to be improved; however, these indicators are used informally. For instance, the customer service team usually collects the number of user accesses and controls so-called problems, but the measurements are not done systematically.

The marketing team is another touchpoint with customers and users. In their market studies, they usually collect customer information using surveys and interviews to understand the profile of the target audience and explore content presentation strategies, for instance. Furthermore, the startup has a pedagogical team (domain experts) who has close contact with the school staff to discuss educational content and understand their needs through periodic visits. Generally, the sales team sells the product a year before it is released: *"We design [the products] using wireframes [...] we discuss internally [to define] the best flow, and work on the visual identity using high fidelity prototypes [...], then we validate it with pedagogical advisors from at least two schools [...], and our salesperson sells [the product] by presenting the high-fidelity prototype [to schools]"* (P1). The development team rarely tests with end users. Most validations and tests are done internally, mainly with the pedagogical team that uploads the educational content to the platform they develop. However, they recognize user research's importance to ground their design decisions better: *"We could have avoided many troubles, but here the idea is born, we work on the idea, throw it to the market, and then get the feedback"* (P4).

Startup B. At startup B, interviews and the EBTR meeting involved eleven professionals from the technology, design, marketing, and CX teams (see Table 1). The startup's business model is Business to Customers (B2C). The startup has a large active users-base (around 180,000 active players). The users are professionals and amateur players of electronic sports using video games. There are two types of players, those who pay to play and those who play using free accounts. The main touchpoint of users with the company is the CX team, which has a team of seven professionals. The CX team can receive as many as 33,000 requests in a day. Most user demands refer to incident reporting, charge-back of payments, and complaints about players' toxic behavior. These demands arrive through different channels (e.g., chat, email, and social media). The user requests are registered on the help-desk platform through tickets that allow tag classification. Much users' information is also collected in an automated way to verify, for example, the number of games played in the month, the number of active users, and subscription payments. However, they still do not take automated measurements focused on continuous product improvement or quality of user experience.

In addition, the CX team receives a lot of user feedback through social media channels (e.g., Discord, Twitter, Facebook). Regarding the amount of feedback received: *"We receive a lot of feedback, but not all of them make sense because sometimes that [feature] is right and the user does not know how to use it [the platform]"* (P15). Interestingly, the users' feedback commonly stored in a single repository is rarely accessed: *"We have a channel called 'Community', we put it [users' feedback information] there, but we don't know if this is being seen or not, it's more a repository."* (P14). However, the technology team still struggles to leverage insightful information from these platforms: *"Currently, we don't have this [feedback] centralized, this is one of the most difficult processes to track because there are many channels, you have to check it on Twitter, on Discord, and verify if someone talked with the player throughout the championship into Discord support [channel]... So, there is a chance to lose some [relevant] information, and our idea is to find a way to centralize all that [users' feedback]"* (P16).

The marketing team is also an important touchpoint with users, where a social media analyst (P14) monitors social networks (e.g., Facebook, Twitter, Instagram, and YouTube) and uses brand personas to target their marketing campaigns. The marketing team has easy contact with users: *"UX designers think it's nice to talk to me [because] I can engage people inside Discord to answer their surveys"* (P14). By using marketing tools (e.g., push mechanisms and modals), they can easily notify and engage users for surveys elaborated by the UX team. The UX team has two UX experts focused on research, design, and evaluation activities involving users. They have already applied several UX techniques for information gathering and understanding user needs (e.g., brainstorming ideas, mind-maps, flowcharts, sketches, prototypes, empathy maps, personas, and usability testing.). However, surveys and interviews are the most common techniques used to gather feedback from users: *"[...] within the competition team, they didn't really know what we were going to do [...] there was much more doubt than certainty and many assumptions. So, I sat down with the PO and said 'why not do a survey with the LOL players'. And then, he and I drafted some questions [and] asked the marketing team to help us to publish [the survey] on Twitter [...] We took the opportunity to understand what they [users] expected from our platform [...] we received 3,000 responses which opened our eyes, gave the team a great insight [that] was a big difference for the squad"* (P8).

The UX team uses information collected from users to inform their design decisions that are shared with the development team, who do not have direct contact with users. The teams' activities (e.g., technology, design, marketing) are driven by OKRs (Objective Key Results) centered on what the company wants to achieve (e.g., increasing competition in games and making it possible to play championships). Based on these goals, UX designers use informa-

tion from users to create prototypes that should guide product development and prioritize their tasks.

Startup C. Startup C is a small company with 11 employees (9 developers, 1 customer success, and 1 domain specialist). The two founders have positions in the commercial and technical areas. The startup develops B2B products based on hardware and software for public and private water and gas companies. At the time of the interviews, they had 30 active contracts with different companies. The founder/CEO who works in the commercial area (P18) and the professional in the customer success area (P19) is the main touchpoints of customers with the company. The commercial contact is mainly with the company's managers for contract negotiation and gathering of requirements, while Customer Success (CS) interacts with professionals who use their product in the field by providing product support.

Through close contact with users from operational sectors, the CS person collects a lot of feedback and suggestions for product improvement, which are reported to the startup's CEO and CTO: *"I collect feedback with them, so I have notes, I have a list of [improvement suggestions], some of them are even simple to implement that make a difference, for example, the [option of] deleting a sample that someone collected, which previously could not be deleted."* (P19). Although they seek to understand the difficulties of the clients, a concern is to discern between individual and collective needs: *"Because sometimes a customer is very keen on one thing, but only he is keen on that thing, so we need to talk among ourselves to understand which needs should go into production as soon as possible, or not."* (P18).

To manage customer demands, they use a ticket system that allows follow-up by service indicators. Due to a lack of resources, the startup does not have UX experts. However, they informally interview their customers to understand their needs and develop prototypes to validate ideas with them. New features are usually tested internally with the domain expert and customer success person who is more familiar with the users' needs. Nevertheless, they recognize the need to have mechanisms to monitor user data as well as to enhance the management and prioritization of tasks for implementing product improvements: *"We need to create a process to facilitate what we commented earlier regarding improving the requirements gathering and the prioritization of [users'] demands"* (P18).

Startup D. Startup D develops applications in the logistics and urban mobility market in the B2B2C (Business to Business to Consumer) model by connecting shippers and couriers of goods and documents. The startup's customers range from large companies such as e-commerce retailers to small merchants; and deliveries are made to consumers, which include individuals or companies. This startup has a high rate of business growth, in fact, it is regarded as a unicorn. It invests in developing its leaders, which includes hiring and training qualified teams in different areas. We interviewed six professionals from the design area.

At that time, the design team had around 34 professionals, and open positions to hire more design experts.

The company has several touchpoints with customers and users, such as marketing, sales, CX, and product design teams. In the design team, in particular, the main touchpoints are UX strategists, product designers, and brand designers. UX strategists work on discovery activities and exploratory research, conducting interviews to investigate user needs and exploratory data analysis to understand market segments. The product designers have contact with the customers who already use their products (i.e., Delivery App and Shipper App). Moreover, brand designers have UX knowledge, working on the company's website design and with the social media audience focused on brand positioning.

The product design team collaborates closely with CX team to resolve user requests. The CX team uses the ticketing system to manage customer demands ranging from bug reports to providing feedback and suggestions for product improvements. The concern for customers extends to all the company's services and products: *"This is a customer-centric company, where everything we do has a clear and direct impact on the consumer, so all money invested is reverted into a positive impact on the life of our customers"* (P24). However, they recognize the need to improve their feedback collection: *"We need to listen to the customer, gather more feedback, and match with the company's business strategy, because I believe this will help us not only to further evolve the product but lead to less pain for those who currently use it, so I see that this is a point that we urgently need to look at."* (P26). At the time of the interviews, representatives from the designers, CX, marketing, and sales teams were working together on an initiative called 'Customer Voice' with the aim of mapping all touchpoints and improving communication channels with customers and users: *"[...] there is a lot of information lost by the company, as many people talk to the customer, we end up not organizing all this feedback, so we are trying to make it closer"* (P25).

UX strategists have direct contact with users: *"The good part of my work is doing research and going out in the field to talk with our audience who uses the product all the time [...], talking to them we generate a perception of who are these people and how they are using [the system]"* (P27). In addition to activities that directly involve users (e.g., interviews, surveys, and user testing), the design team professionals use user data collected automatically, mainly through experiments carried out together with the data team. Experiments are performed (1) to validate a new feature ready to go into production with a specific group of users, (2) to evaluate a validated feature with another group of users, and (3) to optimize existing features. The data team also creates dashboards using metrics and indicators that are requested by the designer team to deeply investigate emergent issues (e.g., a high loss rate of packages). Moreover, product designers leverage user behavior data collected with the HotJar[1] tool to inform their design decisions: *"I particularly like to analyze how customers have used some components that we have been working on within our*

[1] https://www.hotjar.com/.

platform [...] this has helped us understand [for example] how they use the search component and, if they use it [...] to try slightly improve search performance" (P27).

5 Discussion

5.1 How Do Software Startups Deal with UX from Customer and User Information to Improve Their Products?

As aforementioned, we categorized the customer and user information as demands, feedback, usage data, and user profile (see Sect. 4). When analyzing our findings, we found that many users' demands come through support service channels (e.g., emails, calls, chats, and social media). User demands range from bug reports and usability issues to requests for new features. Regarding touchpoints, all startups, regardless of size, have a customer service structure under different names, for example, customers' loyalty (in startup A), customer experience (in startups C and D), and customer success (in startup C).

In all studied cases, the primary touchpoint with the customer and users is the customer service teams. This type of contact from customer-to-company makes startups more reactive when responding to customer and user demands. Customer and user feedback is collected for different purposes. Marketing and sales teams collect feedback primarily for market studies, customer satisfaction surveys, and customer requirements elicitation. Customer service teams receive feedback from users, especially on product defects and suggestions for new features. When the startup has UX experts (e.g., startups B and D), the collection of feedback and user research is mainly carried out with interviews and surveys in a more structured way during product discovery activities. Startups that do not have a UX team (e.g., startups A and C) conduct informal interviews with users in an ad-hoc manner, mainly to validate ideas. As the startup grows, acquires financial resources, and hires more people (e.g., startups B and D), professionals are more likely to efficiently explore user data collected automatically, such as from experimentation with A/B testing, analytics, and log files. Usage data is collected and analyzed primarily to validate new features and discover points for improvement. The collection of user profiles using brand personas is mainly conducted by the marketing team to direct marketing campaigns and define content strategy.

A lack of systematic ways to collect, analyze, and incorporate customer data into the product development process is an issue reported in the literature [29]. In our study, we also encountered this issue mainly with startups with fewer resources and a lack of UX experts, i.e., startups A and C. In more mature startups in terms of UX work (i.e., startup D), we found that collecting and incorporating customer and user information in the product development process is more common. In addition, they use experiments with customers for continuous of new features and optimization of in-use features. Even so, professionals from startup D reported the need to *improve communication channels with the*

customers and users (e.g., the Customer Voice program) and *increase the user research activities to provide insights for continuous product improvement.*

The customer service teams are the main touchpoints with customers and users of the startups. Especially startups with a large base of users can receive hundreds to thousands of requests daily. These startups also reported issues related to *the dispersion of customer and user information*, as mentioned in the literature [11,31]. In startup B, for example, they cannot take advantage of user data that is scattered across different communication channels with users. On the other hand, in startup D, which has more resources, a team specializing in data analysis supports UX professionals in exploring data from CX to understand user demands.

Regarding the difficulty of *identifying metrics for evaluating customer value and product success* [28], we found that this issue also extends to almost all the startups studied. In startups A, B, and C, professionals informally use customer service indicators to guide their actions for product improvement. However, most measurements are restricted to business metrics. For instance, Startup B's professionals still do not collect metrics focused on product or UX quality, as at startup D. A product designer at startup D told us that they usually collect data and analyze user behavior to measure the UX improvements and customer value. Conversely, this practice seems to be a particular need for some professionals of this startup, not always adopted by other teams.

5.2 Threats to Validity

We discuss the study validity with internal validity, construct validity, external validity, and reliability as proposed by Runeson and Höst [23]. For *internal validity,* to increase the precision of our study, we have adopted a methodological triangulation in data collection using two different methods (i.e., interviews and EBTR meetings). Moreover, this study involved various professionals from each startup with different backgrounds and expertise to gain different perspectives. For *construct validity,* at least two researchers participated in preparing the interview scripts, the data collection sessions, and the transcription of the video recordings. The data analysis was conducted incrementally with the participation of all the authors in different steps. All authors intensively discussed the results at all stages. For *external validity,* the data collected on four startup contexts allowed us to obtain a degree of abstraction about the common UX issues for distinct scenarios. However, we understand that there are contextual factors of startups that can affect our study. We do not rule out the need to conduct the same case study on other startups in future work. For *reliability,* more than one researcher conducted data analysis at each stage. We recorded the data collection on video; however, all data were transcribed to text, thus avoiding different interpretations for the researchers involved in creating and refining the codes.

6 Conclusions and Future Work

In addition to identifying the main touchpoints, this study contributes by classifying the types of customer and user information available in the studied startups. We found that the primary touchpoint of customers and users with the companies studied is the customer service area (i.e., CX, customer success, or customer loyalty). B2C startups generally have a large customer base and receive much user feedback and demands through several different channels (e.g., emails, chats, and social media). Next, we summarize the lessons learned about our findings according to characteristics related to the UX work carried out in the studied startups by answering the research question about how software startups deal with UX from customer and user information to improve their products:

- In startups where UX work is performed in an ad-hoc manner and without the support of UX experts (i.e., startups A and C), professionals handle customer and user information reactively. Often, startup professionals improve their products on demand of customers and users, i.e., by responding to users' complaints and needs that arrive from the customer service area. UX issues are usually caught after features launch, as they are not user-tested throughout development. In these contexts, UX-related issues gleaned from actual users or informed by usage data are not part of the product development and improvement roadmap.
- In the startup where UX work was recently incorporated into product development with the support of UX experts (i.e., startup B), customer and user information is leveraged reactively and proactively for product improvement. However, the UX team is small, and these professionals need the collaboration of professionals from different areas to participate in UX design activities and to promote user engagement in their research. In addition, practitioners recognize the need to better leverage user information for product improvement, including defining UX metrics to support their decisions. Nevertheless, multiple touchpoints with users and unstructured information spread across different channels hampered identifying valuable insights and main points for improvement.
- In the startup where UX work is already institutionalized and its value is widely recognized (i.e., startup D), customer and user information is better leveraged to understand market segments and user behaviour to propose new features and understand user pains to improve their interaction with the product. The product and design team is large and has various UX experts. The UX work is expanding to collaborate with other areas in the company through the voice of the customer program, seeking to identify all touchpoints to improve communication with customers and users.

The results of this study can motivate software startups to reflect on how they collect and manage UX information. By knowing how to deal with this information, startup professionals will be able to use it more efficiently to improve the UX of their products by focusing on delivering customer value and product suc-

cess. Future work may investigate effective mechanisms to measure the customer and user value achieved through UX work.

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References

1. Bjarnason, E., Hess, A., Svensson, R.B., Regnell, B., Doerr, J.: Reflecting on evidence-based timelines. IEEE softw. **31**(4), 37–43 (2014)
2. Blank, S.: The Four Steps to the Epiphany: Successful Strategies for Products that Win. John Wiley & Sons, Hoboken (2020)
3. Bosch, J., Holmström Olsson, H., Björk, J., Ljungblad, J.: The early stage software startup development model: a framework for operationalizing lean principles in software startups. In: Fitzgerald, B., Conboy, K., Power, K., Valerdi, R., Morgan, L., Stol, K.-J. (eds.) LESS 2013. LNBIP, vol. 167, pp. 1–15. Springer, Heidelberg (2013). https://doi.org/10.1007/978-3-642-44930-7_1
4. Foundation, I.D.: Customer touchpoints - the point of interaction between brands, businesses, products and customers. https://www.interaction-design.org/literature/article/customer-touchpoints-the-point-of-interaction-between-brands-businesses-products-and-customers. Accessed 08 June 2022
5. Gauthier, J., Penzel, M., Kuester, S., Kumaran, M.: The global startup ecosystem report 2021. Technical report, Startup Genome (2021)
6. Giardino, C., Unterkalmsteiner, M., Paternoster, N., Gorschek, T., Abrahamsson, P.: What do we know about software development in startups? IEEE Softw. **31**(5), 28–32 (2014)
7. Giardino, C., Wang, X., Abrahamsson, P.: Why early-stage software startups fail: a behavioral framework. In: Lassenius, C., Smolander, K. (eds.) ICSOB 2014. LNBIP, vol. 182, pp. 27–41. Springer, Cham (2014). https://doi.org/10.1007/978-3-319-08738-2_3
8. Guerino, G.C., Dias, N.S.B.C., Chanin, R., Prikladnicki, R., Balancieri, R., Leal, G.C.L.: User experience practices in early-stage software startups - an exploratory study. In: Wang, X., Martini, A., Nguyen-Duc, A., Stray, V. (eds.) ICSOB 2021. LNBIP, vol. 434, pp. 122–136. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-91983-2_10
9. Hokkanen, L., Kuusinen, K., Väänänen, K.: Early product design in startups: towards a UX strategy. In: Abrahamsson, P., Corral, L., Oivo, M., Russo, B. (eds.) PROFES 2015. LNCS, vol. 9459, pp. 217–224. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-26844-6_16
10. Hokkanen, L., Kuusinen, K., Väänänen, K.: Minimum viable user experience: a framework for supporting product design in startups. In: Sharp, H., Hall, T. (eds.) XP 2016. LNBIP, vol. 251, pp. 66–78. Springer, Cham (2016). https://doi.org/10.1007/978-3-319-33515-5_6
11. Hokkanen, L., Xu, Y., Väänänen, K.: Focusing on user experience and business models in startups: Investigation of two-dimensional value creation. In: Proceedings of the 20th International Academic Mindtrek Conference, pp. 59–67. AcademicMindtrek'16, ACM, New York, NY, USA (2016)

12. Holmlund, M., et al.: Customer experience management in the age of big data analytics: a strategic framework. J. Bus. Res. **116**, 356–365 (2020)
13. Karvonen, T., et al.: Hitting the target: practices for moving toward innovation experiment systems. In: Fernandes, J.M., Machado, R.J., Wnuk, K. (eds.) ICSOB 2015. LNBIP, vol. 210, pp. 117–131. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-19593-3_10
14. Klotins, E.: Software start-ups through an empirical lens: are start-ups snowflakes? In: Workshop on Software-Intensive Business: Start-Ups, Ecosystems and Platforms, SiBW 2018, Espoo, Finland, 3 December 2018. CEUR-WS (2018)
15. Klotins, E., Unterkalmsteiner, M., Gorschek, T.: Software engineering in start-up companies: An analysis of 88 experience reports. Empirical Softw. Eng. **24**(1), 68–102 (2018). https://doi.org/10.1007/s10664-018-9620-y
16. Lemon, K.N., Verhoef, P.C.: Understanding customer experience throughout the customer journey. J. Mark. **80**(6), 69–96 (2016)
17. Melegati, J., Chanin, R., Sales, A., Prikladnicki, R.: Towards specific software engineering practices for early-stage startups. In: Paasivaara, M., Kruchten, P. (eds.) XP 2020. LNBIP, vol. 396, pp. 18–22. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-58858-8_2
18. Nguven-Duc, A., Dahle, Y., Steinert, M., Abrahamsson, P.: Towards understanding startup product development as effectual entrepreneurial behaviors. In: Felderer, M., Méndez Fernández, D., Turhan, B., Kalinowski, M., Sarro, F., Winkler, D. (eds.) PROFES 2017. LNCS, vol. 10611, pp. 265–279. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-69926-4_19
19. Norman, D., Nielsen, J.: The definition of user experience (UX). https://www.nngroup.com/. Accessed 30 Sep 2019
20. Norman, D., Nielsen, J.: User experience vs. customer experience: What's the difference? https://www.nngroup.com/articles/ux-vs-cx/. Accessed 30 May 2022
21. Olsson, H.H., Bosch, J.: Towards continuous customer validation: a conceptual model for combining qualitative customer feedback with quantitative customer observation. In: Fernandes, J.M., Machado, R.J., Wnuk, K. (eds.) ICSOB 2015. LNBIP, vol. 210, pp. 154–166. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-19593-3_13
22. Ries, E.: The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Currency, Redfern (2011)
23. Runeson, P., Höst, M.: Guidelines for conducting and reporting case study research in software engineering. Empir. Softw. Eng. **14**(2), 131–164 (2009). https://doi.org/10.1007/s10664-008-9102-8
24. Rutitis, D., Volkova, T.: The rise and fall of a database-as-a-service latvian unicorn. In: Nguyen-Duc, A., Münch, J., Prikladnicki, R., Wang, X., Abrahamsson, P. (eds.) Fundamentals of Software Startups, pp. 299–312. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-35983-6_18
25. Saad, J., Martinelli, S., Machado, L.S., de Souza, C.R., Alvaro, A., Zaina, L.: Ux work in software startups: a thematic analysis of the literature. Inf. Softw. Technol. **140**, 106688 (2021)
26. Saldaña, J.: The Coding Manual for Qualitative Researchers, pp. 1–440 (2021)
27. van de Sand, F., Frison, A.-K., Zotz, P., Riener, A., Holl, K.: The intersection of user experience (UX), customer experience (CX), and brand experience (BX). In: User Experience Is Brand Experience. MP, pp. 71–93. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-29868-5_5

28. Sauvola, T., Kelanti, M., Hyysalo, J., Kuvaja, P., Liukkunen, K.: Continuous improvement and validation with customer touchpoint model in software development. In: Proceedings of the 13th International Conference on Software Engineering Advances-ICSEA, vol. 18, p. 62 (2018)
29. Sauvola, T., et al.: Towards customer-centric software development: a multiple-case study. In: 2015 41st Euromicro Conference on Software Engineering and Advanced Applications, pp. 9–17. IEEE (2015)
30. Seppänen, P., Tripathi, N., Oivo, M., Liukkunen, K.: How are product ideas validated? In: Ojala, A., Holmström Olsson, H., Werder, K. (eds.) ICSOB 2017. LNBIP, vol. 304, pp. 3–17. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-69191-6_1
31. Silveira, S.A.M., Choma, J., Pereira, R., Guerra, E.M., Zaina, L.A.M.: UX work in software start-ups: challenges from the current state of practice. In: Gregory, P., Lassenius, C., Wang, X., Kruchten, P. (eds.) XP 2021. LNBIP, vol. 419, pp. 19–35. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-78098-2_2
32. Sirotkin, A., McCabe, B.: The new experience for business: why user experience is the differentiation strategy in the cloud context. In: Marcus, A. (ed.) DUXU 2011. LNCS, vol. 6769, pp. 491–499. Springer, Heidelberg (2011). https://doi.org/10.1007/978-3-642-21675-6_57
33. Sutton, S.: The role of process in software start-up. IEEE Softw. **17**(4), 33–39 (2000)