The impact of UX work on communication and collaboration in software startups

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Abstract. *Software startups are companies that operate under constant time and business pressures and often teams have problems on communication and collaboration. However, little has been discussed about these problems in the literature. Startup professionals have recognized user experience as an important software quality. This paper presents an investigation about the impact of UX work on team communication and collaboration in startups. We conducted a qualitative study with two startups in Brazil and found out six categories of UX work issues. Our work contributes by discussing the impact of these issues on team communication and collaboration which are related to team composition, tools adopted and organization culture.*

1. Introduction

Startups are recognized as highly relevant companies for the production sector of any country. The global startup economy has more than doubled over the last five years[Gauthier et al. 2021]. Although there is no consensus on the definition of a software startup, many share an understanding that software startups are the ones that have their activities directly related to software engineering [Unterkalmsteiner et al. 2016].

In software startups, professionals recognize the value that user experience (UX) brings to the product and create an advantage competitive for the company [Hokkanen et al. 2015]. The ISO-9241 norm [DIS 2010] defines UX as "*user's perceptions and responses that result from the use and/or anticipated use of a system, product or service*". However, startup professionals report that they struggle with using UX design activities during software development [Silveira et al. 2021]. Consequently, startup developers often focus more on technical aspects of the product rather than user needs [Saad et al. 2021]. Besides, communication and collaborative work can be directly impacted by the software development approaches, tools, and artifacts adopted by teams [Sharp et al. 2008]. According to Berg et al.'s literature review [Berg et al. 2018], research straight related to team communication and collaboration in startups is still lacking.

Studies revealed that in terms of communication and collaborative work dynamics, for instance, startups and established companies have different software engineering experiences and needs [Berg et al. 2018]. Unlike established companies that have well-defined processes, startups generally adopt reactive and informal practices focused on the productivity and freedom of their teams; practices that also extend to UX work [Unterkalmsteiner et al. 2016] [Berg et al. 2018].

This paper aims to investigate how UX work affects communication and collaboration in software startups. Our investigation was motivated by the lack of literature that discussed these topics and considering the importance that startups professional assign to UX work. In our study, we collected data from involving 16 professionals (e.g., developers, product and UX designers) using two methods: (i) interviews and (ii) a retrospective method called Evidence-based Timeline Retrospective (EBTR) [Bjarnason et al. 2014]. The collected data were analyzed by applying the coding technique. As a result, we present six categories

2. Related work

By analyzing experience reports from 88 software startups, Klotins et al. [Klotins et al. 2019b] report that the structures of startup teams range from hierarchical to flat. In hierarchical structures, miscommunication about company goals and lack of transparency in decision-making can undermine trust between team members. However, involving the whole team in all decisions can hinder the performance and motivation of the team. In another study with 84 startups, Klotins et al. [Klotins et al. 2019a] discuss that the challenge for startups in the early stage is the lack of team expertise, while in the stabilization phase, the challenge is the engagement and coordination of the teams. In particular, more mature startups may also experience problems with coordination and maintaining efficient teamwork when multiple teams are distributed in different time zones [Klotins et al. 2019b]. Regarding remote work, Kemell et al. [Kemell et al. 2020] revealed that startups often discuss the importance of tools in facilitating communication, since startups in early stages often do not have access to a shared workspace.

The literature has reported that studies exploring communication issues in UX activities are scarce [Guerino et al. 2021, Choma et al. 2022]. As a result of a case study with five software startups, Guerino et al. [Guerino et al. 2021] provide some recommendations to assist early-stage startups in adopting UX practices. Considering that early-stage startups have small teams, they recommend that all results related to UX work be shared with all members to show the value of UX for product quality. In an exploratory study on the influences of UX factors in the Agile UX context of software startups, Choma et al. [Choma et al. 2022] pointed out that shortcomings in communication between teams hinder UX work, especially in mature and larger startups with UX teams. The authors argue that rounds of quick talks during agile ceremonies help to mitigate the professionals' lack of consensus about UX value and prevent communication issues. In a survey with 88 software professionals of startups, Silveira et at. [Silveira et al. 2021] report that the difficulty related to communication and collaboration between UX and other professionals is most often pointed out by professionals from startups that have UX teams.

Considering the related work above, we can see that they present discussions about team communication, lack of team expertise, and the user of tools for communication in the context of software startups without taking into account the UX work. Although the other works present discussion on similar topics of our study, they do not put the lenses on the impact that UX work can cause on the team communication and collaboration which are the central discussion of our paper.

3. Research method

Due to the restriction of COVID-19, the interaction with companies has changed in the last few years. The conduction of face-to-face data collection has moved to remote mode. This study was previously approved by the Ethics Committee at the Federal University of São Carlos, Brazil (CAAE number: 29367020.0.0000.504). All the researchers involved in this study had 5+ years of experience in carrying out empirical studies about UX and Software Engineering in industrial contexts.

After examining some qualitative methods, we decided to perform online semi-structured interviews and the "*Evidence-based Timeline Retrospective*" (EBTR) method proposed by [Bjarnason et al. 2014] that is based on retrospective ceremonies commonly performed by agile teams (see the four EBTR steps in Figure 1). In preparation step (step 1), the *responsible* for EBTR implementation together with the *facilitator* define the retrospective's *goal* (a) referring to the issues targeted for improvement; the key *aspects* (b) related to these raised issues; and *evidence* (c) related to each aspect is gathered from different sources of information – e.g., release and project planning, issues tracking systems, bug reports, interviews with team members. In timeline construction (step 2), a *timeline* (d) is built based on evidence collected from interviews, for instance. In the retrospective meeting (step 3), the facilitator invites the participants to make discussions focused on the retrospective's *goal* guided by the timeline. In the validation (step 5), the facilitator *updates the timeline* (e) with additional information gathered from the participants' discussion during the meeting, *summarizes outcomes* (f) produced from the meeting, and then shares these findings with the team members for getting feedback in a *follow-up meeting* (g).

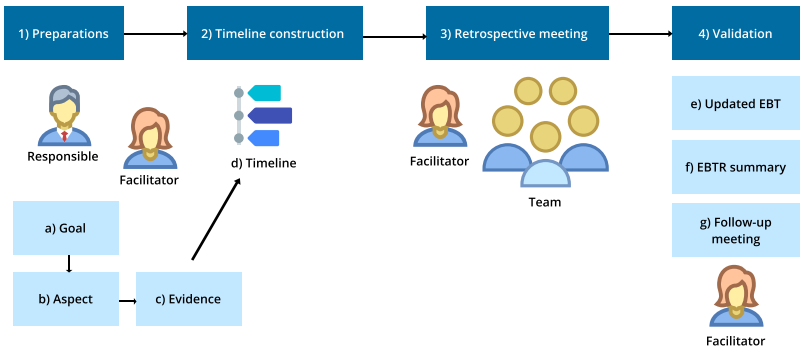


Figure 1. EBTR method overview. Adapted from: [Bjarnason et al. 2014]

Our data collection took place in two software startups separately we refer to as Startup A and Startup B for confidentiality reasons. Startup A was founded in 2015 and operates in the e-sports segment; its main product is a platform focused on preparing professionals for e-sports tournaments; had 70 employees and 1 million players (i.e., end-users); and 2 experts were dedicated to UX work. Startup B was founded in 2016 and operates in the education area; its main product is an educational kit to insert robotics into curricular teaching; had 80 employees and 55k students and 250 schools as end-users; there was only a User Interface (UI) designer in the company. In our initial contact with the two startups, we held an informal conversation with a key member of each startup to obtain an overview of the companies' characteristics (see key member profile in Table 1).

They also helped us to recruit other company professionals for our interviews and EBTR meetings (see the 16 participants' profiles in Table 1).

Table 1. Profile of the participants of Startups A and B.

Startup	Role (Acronym)	Time in the company*	Professional experience*	Interview	EBTR
A	Product Designer Manager (PDM)**	2	∼ 4	x	x
A	UX Designer (UX1)	∼ 2	5	x	x
A	UX Designer (UX2)	0,3	7	x	
A	Front-end developer (DEV1)	0,8	2	x	
A	Product Designer (PD1)	∼ 2	3		x
A	Product Designer (PD2)	2	8		x
A	Product Designer (PD3)	1	1		x
A	Product Designer (PD4)	1	4		x
A	Social Media Analyst (SM)	2	3	x	
A	Community Experience (CE)	∼ 4	4	x	
A	Product Owner (PO)	1	∼ 7	x	
B	Technology Director (DT)**	2	20	x	x
B	Customer Service (AT)	7	7	x	x
B	Fullstack Developer (DEV2)	2	5	x	x
B	Marketing Coordinator (MKT)	1	20	x	x
B	UI Designer (DS)	2	10	x	x

* in years
** key member

3.1. Interviews and EBTR conduction

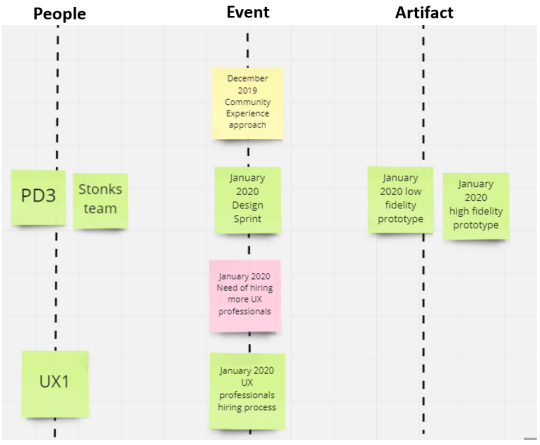
We interviewed 7 professionals from Startup A and 5 professionals from Startup B to obtain details about the UX work performed at each startup over time. The participants were selected based on time in the company and their involvement with users, product development, design, and UX activities. Our goal was to understand the UX work-related issues that affect team communication and collaboration. We prepared a script to explore the following subjects: (i) the interviewee's background (i.e., professional experience, when they joined the company, what positions they had held); (ii) information on their day-to-day work, the use of processes, artifacts, tools, and typical interaction with other practitioners; (iii) the perceived challenges regarding UX work; (iv) suggestions for process improvement; and (v) personal contributions and involvement in UX activities. The interviews lasted between 40 and 60 minutes and were recorded with the participants' prior consent by using Google Meet[1].

For each startup, we followed the four steps of the EBTR method. To the preparation of the EBTR application, we first define the *goal* (see Figure 1 (a)) as *investigating the artifacts, tools, practices, and other elements that characterize the two software startups UX daily work*. Based on [Kashfi et al. 2016], we defined three related *aspects* (see Figure 1 (b)) to address this goal: (i) people - those who promoted the integration of UX in the company or have functions related to UX; (ii) events - UX activities performed formally or informally; (iii) artifacts – tangible results of UX work (e.g., documentation). Taking into account the data collected from interviews, we identified a set of evidence (see Figure 1 (c)) to build a *timeline* for each startup. Each *timeline* contained the mentioned aspects (i.e., people, events, and artifacts) concerning UX activities carried out by professionals (see a timeline construction example in Figure 2).

[1]https://meet.google.com/

Aspects and evidence	Data extracted from the interviews
People	PD3
Event	January 2020 - Design Sprint
Artifact	Low fidelity prototype and high fidelity prototype
Evidence	E1 - "In our team, something happened that I thought was really cool that we did a design sprint so the whole team got a problem and..." (DEV1 - Startup A) E2 - "We even started a few moments and 'let's do a design sprint here within the squad' but at the same time while we are developing..." (PO - Startup A)

a) Example of data extracted from the interviews for the construction of the timeline.



b) Timeline built using an online tool to support teamwork.

Figure 2. Example of data extraction and timeline construction

We conducted two EBTR meetings, i.e., retrospective meetings, with the participation of 6 and 5 professionals from Startups A and B respectively (see the last column in Table 1). One day before the meeting, to stimulate the participants' memory, the researchers send a message to the participants encouraging them to visit the timeline before the EBTR meeting. The timeline was available from Miro tool[2] and the participants could make notes of all their memories about the events and their details. Each retrospective meeting lasted around 2 hours. A researcher conducted the retrospectives meetings playing the facilitator role (first author), while two other researchers observed the participants and took notes (second and fourth authors).

In the meetings, we first introduced our EBTR's goal and the professionals were invited to check the information on the timeline and discuss the events. Facilitator asked some focus questions to the participants addressing the following topics: the main events that impact the performance of UX activities, the activities related to end-users and UX that were carried out, the artifacts produced by such activities, the contributors complaining about the need to take care of the UX work, the role and work of those contributors, and the UX work the contributors did that did not come from end-user requests. After the discussion about the timeline, the facilitator invited the participants to fill out the reflection board considering what they were doing and worked, what did not work, and actions that could be done for improvements in their work. Finally, in the validation step, the researchers collected feedback on the EBTR method. Due to the limited number of pages, we will not report the results of the EBTR feedback. Interview and EBTR scripts are available at the link[3].

3.2. Analysis

We transcribed about 11 hours of interviews and EBTR meetings. In addition, we also consider the data contained in the timelines and reflection boards. We conducted the data analysis through the open coding method [Saldaña 2021] and used Airtable[4] tool to

[2]https://miro.com/
[3]https://bit.ly/3IG7nJ0
[4]https://www.airtable.com/

support it. In the open coding method, codes are related to text snippets and these codes are named with labels that give particular meaning to the text fragments. The open coding process was carried out in three steps. In the first step, two researchers performed the open coding individually. In the second step, the researchers held an agreement meeting to cross-check their codes, join similar codes, and refine them. In the third step, the codes were grouped into categories. To keep our focus on this paper's aim, we filtered six categories that were UX work-related to issues that impact teams' communication and collaboration.

4. Results

Looking for issues affecting communication and collaboration in the context of UX work, we identified six categories of issues that are discussed in the paragraphs below. In Section 5, we discuss how these issues affect communication and collaboration in the context of UX.

The teams characteristics category refers to how startup teams are organized, how UX specialists are allocated, and the background of professionals. Startup A has a product team with product designers, graphic designers, and two UX experts (UXers). In the past, UX work was centralized and experts worked on demand from multiple teams. However, UXers decided to work allocated within development teams. Because they were recently hired, UX professionals do not yet have their roles well defined. Conversely, Startup B does not have professionals dedicated to UX. Usually, the UI designer designs a prototype and discusses it with the developers. After this discussion, some modifications can be made until the prototype is delivered to the developers.

We defined a category labeled as UX approaches and practices which refers to approaches, methodologies, and practices adopted to develop the practice of UX within the company, as well as issues related to the integration of UX design in the development process. We found that Startup A professionals follow the Dual-Track Agile to conduct UX work [Lape 2021]. In this agile approach, a cross-functional product team breaks its daily development work into two tracks (i.e., discovery and delivery). While UX designers are responsible for the *discovery* process, focusing on producing, testing, and validating product ideas; product designers are responsible for the *delivery* process, working on turning ideas from the discovery phase into an actual product [Lape 2021]. Some UX techniques mentioned were: personas, empathy maps, usability tests using heatmaps tools, heuristic evaluation, card sorting, interviews, and brainstorming. At Startup B, the UX work is informally conducted and the participants have not mentioned any UX techniques. User surveys are typically performed by the marketing team. New features are tested internally with a pedagogical team.

More specifically about communication and collaboration tools, we uncovered a category that encompasses tools adopted to support teamwork and organization of UX documentation. Startup A professionals use Discord for internal communication and for contact with their users. For task management, developers and designers use Jira. Some design tools mentioned to support UX work were: Notion, Figma, XMind, Google Drive, and Google Meet. At Startup B, professionals use Colab (ticket management tool) to manage user requests and demands received by the support team, Slack for internal communication, and Meistertask for workflow management.

The collaboration between teams category refers to information exchange between professionals working in product design (e.g., product designers, UXers, and UI designers) and professionals from different areas (e.g., development, marketing, support), including sharing knowledge, UX results, and access to data sources of users. In both startups, the professionals who design and develop the product have greater interaction with the marketing and support teams. In Startup A, we found that the marketing area (especially social media) has more direct contact with users through communication channels and can help with knowledge and even recruit people for UX activities that need more user involvement. Working under constant pressure and a high degree of uncertainty, the scope has constantly changed during the software increment development. However, developers complain that these changes could be communicated in advance or negotiated with the product team. At Startup B, the support team works closely with the development team representing the voice of the customer by bringing user demands, e.g., complaints, requests for new features, and suggestions for product improvements.

The UX documentation category addresses how UX documentation is organized and made available to startup teams, including UX data sources. At Startup A, UXers and product designers generate various UX artifacts (e.g., prototypes, empathy maps, flows, and user research reports). Usually, these artifacts are stored in the tools where they are generated. One of the interviewees (UX1), in particular, uses Notion as a tool to organize and concentrate the generated UX documentation. However, due to time pressure, professionals cannot maintain documentation fully organized and updated, according to UX2. In Startup B, the prototypes are an important source for developers to achieve greater assertiveness in predicting time and effort to establish deadlines for the fulfillment of development tasks. Usually, the UI designer creates initial flows by scratching with paper pencils and then develops prototypes on Adobe XD. However, these artifacts are also documented in an organized way.

The category labeled as UX culture and value addresses the dissemination of UX culture and awareness of UX value, which encompasses the need for startup professionals to understand how they can work with UX and show value with the results of the UX application. Regarding sharing of UX knowledge, UXers from Startup A seek to involve professionals from other areas in UX activities to raise awareness of the importance of UX for the startup's business. By participating in these activities, professionals have demonstrated satisfaction in collaborating to improve the product UX quality. Paraphrasing the PDM's comment, startup professionals need to understand the meaning of UX to value it. As soon as UX work was formally introduced in the startup, the UX expert (UX1) decided to share knowledge about UX work by conducting design workshops with developers and reporting the results of a UX survey for everyone at the startup. In Startup B, UX knowledge is very limited. As aforementioned, some UX activities (e.g., prototype and user surveys) have been carried out in an ad-hoc manner. But the company intends to invest in UI designer training and expands its knowledge in the UX area.

5. Discussion and Study Validity

In this study, we report communication and collaboration issues that characterize UX work from data collected in two software startups. We found that communication issues tend to be more common in startups where UX work is conducted regularly and have a larger team working on product development, as seen in Startup A. This finding is

corroborated by Choma et al. [Choma et al. 2022] who found that shortcomings in communication between teams can hinder UX work, especially in mature and larger startups with UX teams. We argue that, as UX work becomes more integrated into the software development process, practitioners need to adopt more efficient mechanisms for communicating UX issues to avoid a lack of support and alignment between teams and other areas of the startup.

Regarding team characteristics and collaboration between teams categories, we found that the main problem is the lack of alignment between teams. As to Startup A participants, often UXers spend time and effort developing new products and the commercial team sells a different product than what was idealized. Also, a lot of time is wasted when a change is not communicated to the development team in advance. Recently, some communication issues have been overcome at Startup A through UXers allocated within the teams. In this work setup, they shortened the time to resolve UX issues by closely assisting product designers and developers. As to UX culture and value category, the challenge of communicating UX results and evangelizing the UX culture as pointed out by [Guerino et al. 2021] are issues also raised in our study. UXers constantly face resistance from startup members when introducing UX practices either due to a lack of resources or unawareness of UX value. Evangelizing UX and involving professionals from other areas in UX activities was a manner that UXers from Startup A found to disseminate the value of UX. Issues related to categories UX approaches and practices, communication and collaboration tools, and UX documentation can impact how startups assist their customers and users. We found that both startups are highly reactive to their users' demands, from complaints to suggestions for product improvement. However, in both, the UX demands are not organized and accessible enough. Professionals are not able to meet user demands quickly. In addition, the adoption of different design tools by professionals makes sharing documentation and UX artifacts difficult.

The study limitations are discussed from the perspective of threats to validity in flexible designs based on [Robson and McCartan 2016]. The *description validity* covers the setting and details about the research method adopted. In particular, EBTR provides well-defined steps to conduct the data collection and validated it from the perspective of the participants. As for *interpretation* issues, we recorded all the online interviews and retrospective meetings and later transcribed them in text format to ensure a consistent understanding of the data in further analysis. Additionally, we used data triangulation by gathering data from different sources (i.e. interviews, retrospective meetings, timeline collaborative construction, and reflection board) in supporting the data interpretation. Regarding *internal generalizability*, i.e. generalizability of conclusions within the setting studied, in our study, the startups' key members helped us to recruit participants for the different research steps which involved participants which knowledge about the organization's software development process and UX work. Considering *external generalizability*, we collect data from companies with different characteristics in relation to UX work, therefore, our findings can be explored in further work considering similar contexts.

6. Conclusions and future work

In this paper, we investigated the UX work-related issues which affect teams' collaboration and communication in the context of software startups. We carried out interviews and workshops using the EBTR method to gather data and applied the open coding method

to carry out the data analysis. Our findings reveal six categories that show issues and challenges impacting on teams' collaboration and communication.

Our results showed team characteristics, like the presence of a UX team, affect communication among startup professionals. We saw UX work running with a whole team and, on the other hand, some UX practices running even without a dedicated professional. Depending on these characteristics, team collaboration and communication can be benefited or hindered. Another aspect we found is related to the choice of UX techniques. Some practices like brainstorming can help to improve collaboration and communication between the UX team and others. We saw that the company's culture regarding the vision of UX value can promote collaboration between teams. The tools adopted by startups can facilitate or hinder the access of different teams, which is important to promote collaboration between teams and improve UX work. For future work, we intend to explore the data collected from the reflection board during EBTR workshops. This data contained the participants' points of view about what worked, what needs to be improved, and what would be the actions concerning UX work. We have not explored in details this data.

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