Integrating UX principles and practices into software development organizations: A case study of influencing events

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A B S T R A C T

Current studies on User eXperience (UX) integration often do not investigate or reflect on the transition companies go through from only developing Graphical User Interfaces (GUI) to also considering usability and more recently UX. Understanding this transition provides a more holistic and realistic picture of integration and can be a rich source of knowledge for improving UX integration in the software industry. Applying case study and grounded theory research we show that UX integration, like other organizational changes, can include a mixture of planned and emergent initiatives, and is influenced by various intertwined events; not only those that reside inside an organization but also those external to it. We also show that different decisions that are made outside the authority of UX practitioners have an inevitable impact on enabling or prohibiting UX integration. In addition, we found that for a successful integration, practitioners need to explicitly consider and address the characteristics of UX, otherwise, the integration efforts may have a lopsided focus on the pragmatic aspect of UX, consequently, leave the hedonic aspect unaddressed. Based on our findings, we present four lessons learned and five pitfalls companies should consider to go beyond GUI design and usability to also address UX.

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1. Introduction

Delivering a large set of functions is often no longer enough for the business success of software, rather various software quality characteristics also need to be considered in design and development (Chung et al., 2000). One such characteristic is User eXperience (UX) that relates to the actual experience of the end users with the software. ISO/IEC 9241 (ISO, 2010) defines UX as *"a consequence of the presentation, functionality, system performance, interactive behavior, and assistive capabilities of an interactive system, both hardware and software. It is also a consequence of the user's prior experiences, attitudes, skills, habits, and personality."* Good UX not only contributes to higher work motivation and performance, but can also affect the well-being of users, and is crucial to maintain or gain market shares (Hassenzahl, 2010; Nass et al., 2012). Although practitioners cannot guarantee a certain experience (e.g., excitement or curiosity), they are recommended to consider principles and practices that can make it more likely to deliver an overall appealing UX (Hassenzahl, 2010). We refer to these principles and practices as *UX principles* (e.g. UX is dynamic and changes over time) and *UX practices* (e.g. identify users' emotional requirements).

Applying UX principles and practices in isolation is not enough and, as empirical research findings show, early and continuous attention to them is required to ensure delivering a good UX through the developed software (Abrahão et al., 2010; Ferreira et al., 2012; Ovad and Larsen, 2015). Hence, UX principles and practices need to be integrated into the development processes and considered early on and throughout projects in order to have an impact (Ferreira et al., 2011; Isomursu et al., 2012). We refer to *the timely process of integrating UX principles and practices into development processes and organizations* as *UX integration*. Here, by integration, we emphasize making these principles and practices an integral part of the development processes and not merely add-ons. UX principles and practices should be adjusted to and aligned with already existing software development principles and practices. Most importantly, it is not enough to introduce them only in later stages of software development, rather, organizations need an early and continuous commitment to these principles and practices for them to have an impact (Ferreira et al., 2011; Isomursu et al., 2012).

Similar to the case of integrating usability (Gulliksen et al., 2004; Rosenbaum et al., 2000) and quality characteristics in general (Berntsson Svensson et al., 2012; Paech and Kerlow, 2004), practitioners face various challenges in UX integration (Kuusinen, 2015; Lárusdóttir et al., 2016; 2012; Law et al., 2009). These challenges vary in nature and range from more practical challenges (e.g. lack of tools and methods to support UX practices in software

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development processes (Isomursu et al., 2012; Law et al., 2014; Vermeeren et al., 2010) to more fundamental challenges (e.g. lack of a unified understanding of the concept of UX in the software industry (Kuusinen and Väänänen-Vainio-Mattila, 2012; Lallemand et al., 2014; Väänänen-Vainio-Mattila et al., 2008).

To support practitioners in their UX integration efforts, various empirical studies report on challenges and success factors for usability and UX integration (Gulliksen et al., 2004; Kashfi et al., 2016; Kuusinen, 2015; Lárusdóttir et al., 2016; 2012; Law et al., 2009; Rosenbaum et al., 2000). These studies, however, often do not investigate or reflect on the transition companies go through from only developing Graphical User Interfaces (GUI) to also considering usability and more recently UX Similarly, these studies do not investigate how these challenges and success factors or their influence on integration change over time. Hence, little is known about how these challenges and success factors emerge and influence UX integration over time and as an organization moves beyond usability to also address UX. Understanding the transition provides a more holistic and realistic picture of UX integration and can be a valuable source of knowledge for both researchers and practitioners who aim to improve UX integration in certain organizations or in the software industry in general. This knowledge can help the community to learn from, apply, or customize and extend the existing ways to improve integration in other contexts (e.g. usability integration) also in the case of UX. Such knowledge can help practitioners better predict and plan to overcome such challenges through employing success factors that suit their organizations. Researchers can also better support practitioners through developing more industry relevant findings.

We performed a case study (Runeson et al., 2012) to address this research question: *How does UX integration unfold over time within the context of an organization? And, what are the main intertwining events that impact UX integration as it unfolds?* We gathered longitudinal (retrospective) data and performed a Grounded Theory (GT)-based (Strauss and Corbin, 1998) analysis of our data to investigate the main **events** that in an interplay with each other impacted the phenomenon under study (Runeson et al., 2012), in our case, UX integration. Here, by event we mean any decision, activity, action, or circumstance that contributed to changes in the organization. For this purpose, we investigated over two decades of events in a Swedish software development company following the principles of GT research.

This paper is organized as follows: Section 2 describes the background and related work. Section 3 presents the research methods applied in this study. Section 4 describes the findings. Section 5 includes our discussion and implications of the findings. Finally, Section 6 presents some concluding remarks and future directions of the research.

2. Background

Usability is often seen as a necessary precondition for good UX yet different from it (Hassenzahl, 2008; Lallemand et al., 2015). One of the widely used definitions of usability is given by ISO/IEC 9241 (ISO, 2010): *"the extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use."* UX has five unique characteristics that differentiate it from usability (and all quality characteristics for that matter): UX is *subjective* (heavily relies on human perception), *holistic* (includes both hedonic and pragmatic aspects of use), *dynamic* (changes over time), *context-dependent* (is situated in context), and *worthwhile* (encompasses positive and meaningful consequences of use) (Hassenzahl, 2010).

Although practitioners cannot guarantee a specific experience, applying certain principles and practices can increase the likelihood of delivering a good UX (Hassenzahl, 2010). We refer to such principles and practices as *UX principles and practices*. Here, by *principle* we mean "a comprehensive and fundamental law, doctrine, or assumption" (Chapra and Canale, 1998). Principles provide the basis for many different software practices (Bourque and Fairley, 2014) and are important factors and fundamental concepts that practitioners need to take into account in their work. UX principles, in fact, reflect the understanding of UX as a phenomenon. We separate *principles* from *practices*, activities that practitioners need to perform in order to satisfy the principles (Bourque and Fairley, 2014). Practices are performed throughout the life-cycle of a software system and in different steps of the process (analysis, design, development, evaluation). *Tools and methods* specify in more details 'how' these practices shall be performed to satisfy the principles (Bourque and Fairley, 2014).

Practitioners still do not have access to standards or agreed upon lists of principles and practices that can support delivering a good UX through the developed software. Scattered examples of UX practices and principles can be found in UX literature. Table 1 tabulates the description of the above terms and provides examples for each.

Admittedly, practitioners can also apply User-Centered Design (UCD) principles and practices to address UX (ISO, 2000). Yet, empirical data shows that although an ideal UCD process should focus on the overall UX, this aspect of UCD is often ignored in practice (Mao et al., 2005). Furthermore, whilst research on UX emphasizes the hedonic aspect of software use, practitioners who apply UCD still mainly focus on functional and usability issues (Kuusinen and Väänänen-Vainio-Mattila, 2012; Väänänen-Vainio-Mattila et al., 2008). Therefore, in this paper, we differentiate between UX integration and usability integration (these two are also referred to as UCD integration in current UX and usability integration literature). While the latter includes efforts to assure usability, the former concentrates on going beyond usability and also focusing on the hedonic aspect of UX.

As we mentioned, applying UX principles and practices in isolation is not enough; they rather need to be integrated into the development processes and organizations to be effective (Abrahão et al., 2010; Ferreira et al., 2012; Ovad and Larsen, 2015). However, many organizations still face various challenges that prevent them from achieving a sustainable UX integration (Alves et al., 2014; Väänänen-Vainio-Mattila et al., 2008; Kuusinen and Väänänen-Vainio-Mattila, 2012), an integration successful not only in a short period of time but also maintained over time.

Empirical studies show that a successful integration requires a long-term commitment and can be achieved over a long period of time through a combination of changes to the processes or organizations (Gulliksen et al., 2009). Hence, when analyzing UX integration challenges and success factors, we need to investigate how they, or their influence on integration, may change over time rather than only investigate a snapshot of these challenges and their influence on integration. More importantly, we also need to investigate how organizations move from only developing user interfaces to also paying attention to usability and then UX (Hassenzahl, 2003; 2010). The insights that can be gained from such investigations can help the community to learn from, apply, or customize and extend the existing ways to improve integration in other contexts (e.g. usability integration) also in the case of UX. Nevertheless, such analyses of UX integration challenges and success factors are rare in existing research.

In our study of the related work, we found at least four shortcomings in the current literature on UX integration:

(i) these studies often do not differentiate UX and usability or address how these differences can impact day-to-day work of practitioners or integration efforts (compare for instance

Table 1
The definitions of UX principles, practices, tools, and methods.

Term	Description	Examples
UX principles	important factors and fundamental concepts that reflect the understanding of UX as a phenomenon. Practitioners need to take these principles into account in their work	Both hedonic and pragmatic aspect of software use play an important role in forming UX, UX is temporal
UX practices	activities that practitioners need to perform in order to satisfy the principles	Identify users' personal goals and preferences, create prototypes, involve users in the design process, evaluate the software from both pragmatic and hedonic perspectives
UX methods	impose structure on the practices with the goal of making them systematic and ultimately more likely to be successful	Survey, questionnaire, mind mapping, field study, cognitive mapping, design studio
UX tools	computer-based programs or analog means that assist practitioners in performing various practices and are often designed to support particular methods and like them intend to make the work of practitioners more systematic	Persona, eye-tracking programs, visual design and prototyping tools, Attrakdiff (a specific type of satisfaction questionnaire)

Schaffer's guideline on usability integration (Schaffer, 2004) and Schaffer and Lahiri's UX integration guideline (Schaffer and Lahiri, 2013)). These studies sometimes even use the terms UX and usability interchangeably (e.g (Ardito et al., 2014; Federoff and Courage, 2009; Lanzilotti et al., 2015)).

(ii) those studies that explicitly take differences between UX and usability into account, mainly focus on how the concept of UX is perceived in the industry (e.g. Kuusinen and Väänänen-Vainio-Mattila, 2012; Lallemand et al., 2014; Väänänen-Vainio-Mattila et al., 2008), or on evaluation activities and the role of UX measures in challenges practitioners face (e.g. Isomursu et al., 2012; Law et al., 2014; Vermeeren et al., 2010). They, therefore, do not often discuss other topics related to UX integration (e.g. communication and collaboration between UX and non-UX practitioners).

(iii) those studies that report on challenges and success factors often give a short snapshot of the current state of challenges and success factors in software companies and do not investigate the transition from GUI design to also addressing usability and UX. Examples are survey studies that gather practitioners' views on UX or usability challenges and success factors (Gulliksen et al., 2004; Rosenbaum et al., 2000; Venturi et al., 2006). These studies provide a valuable collection of challenges and success factors but, because of their non-longitudinal nature, cannot necessarily reflect on the transition, or describe how these challenges and success factors influence integration over time.

(iv) the existing limited number of longitudinal studies also often only focus on usability or UCD practices in general or do not clearly differentiate them from UX and UX integration (e.g. Cajander et al., 2010; Cajander et al., 2014; Federoff and Courage, 2009; Gulliksen et al., 2009). Furthermore, when investigating events that can influence integration, these studies tend to focus more on events that happen inside the organizations. In addition, these studies often focus on direct manipulation of processes and organizations by researchers to transfer knowledge and expertise, in form of action research, and then investigate the impact of these manipulations. They, therefore, do not often explore other types of events that in a real industrial setting may influence integration over time.

Below we elaborate on the handful of longitudinal studies we found as they are the closest to our study in their approach to investigating integration. Gulliksen et al. (2009) performed a longitudinal case study to investigate challenges in usability work in a large Swedish organization. They applied an action research approach and over four years took an active role in making changes to usability work and introducing principles and practices of UCD. Gulliksen et al. describe various activities that in an interrelation with each other impacted usability integration in the organization.

These activities are divided into three categories based on their nature: strategic (what the organization needs to do), process (usability practices), and individual (who performs what and how their attitudes impact usability integration). Gulliksen et al. conclude that integrating UCD requires a long-term commitment and can be achieved over a long period of time through a combination of changes to strategy, process, and internal stakeholders' attitude as well as day-to-day work (Gulliksen et al., 2009).

Through two longitudinal action research projects, Cajander et al. (2010, 2014) studied how UCD principles can be integrated into software companies. They first identified the problem areas, i.e. challenges to usability integration, in the case companies then proposed and implemented solutions for them. One such solution is usability coaching that supports practitioners in reflecting on their views and actions, as well as their role in promoting usability in their organizations. Similarly, Eriksson et al. (2008) studied how usability roles can be introduced into software companies. They interviewed the practitioners holding such roles in five case companies to better understand problems they face in their day-to-day work. They then proposed improvements to enhance the effectiveness of these roles.

Federoff and Courage (2009) studied how a transition from waterfall to agile in a software company negatively impacted UX practices and what strategies could decrease this impact and contribute to a better UX integration. They, however, seem to use the terms UX and usability interchangeably. As another example, Winter and Rönkkö (2010) investigated eight years of UCD process in a product development company. They discuss how in the context of this company, principles and practices of UCD are operationalized. In addition, Winter et al. applied an action research approach to improve the state of usability integration in the company. They, for instance, introduced new UCD practices in the company that could potentially address some of the identified challenges. One example is a new way of presenting the results of usability testing to internal stakeholders.

The above studies show the difficult and time-consuming nature of efforts to integrate UX and usability principles and practices into development processes and organizations. They also highlight the importance of the long-term commitment of internal stakeholders and applying a combination of activities in different levels of the organization, from for instance higher level strategies to day-to-day work of stakeholders (Gulliksen et al., 2009). However, as we mentioned before they either merely focus on usability or do not clearly differentiate it from UX.

This study extends the work previously done by the above studies. Here, rather than focusing on generating a comprehensive list of challenges and success factors to UX integration, we aim to reflect on and learn from a chronological study of events that over two decades impacted GUI development, usability and UX integra-

tion in a case company. We reflect on the company's transition towards UX integration, the interrelation between various events, and the facilitating and prohibiting roles they played in this transition.

3. Research method

The core of this paper is a chronological analysis of the transition the case company has gone through over the last two decades to improve UX integration. Our analysis accentuates the way in which UX integration emerges and develops through time and uses 'events' as our unit of analysis. Here, by event we mean any decision, activity, action, or circumstance that contributed to changes in the organization.

We performed a case study (Runeson et al., 2012) using longitudinal (retrospective) data and performed a Grounded Theory (GT)-based (Strauss and Corbin, 1998) analysis of our data. As Fig. 1 depicts, we followed Strauss and Corbin's guidelines (Strauss and Corbin, 1998) to guide our data gathering and analysis. GT is a popular method in various fields including software engineering and development as it is suitable for investigating 'what is going on' and generating new theories rather than verifying an existing theory (Stol et al., 2016).

Performing a case study using longitudinal data provided the following benefits (Runeson et al., 2012) which suited our research aim:

- it is the recommended methodology for investigating the evolution of complex phenomena over time
- it facilitates addressing research questions over time
- it reduces the risk that the findings only reflect a transient phenomenon

3.1. The case company

The case company is a medium-sized international software development company in Gothenburg, Sweden. At the time of performing this research, the company had around 2500 employ-
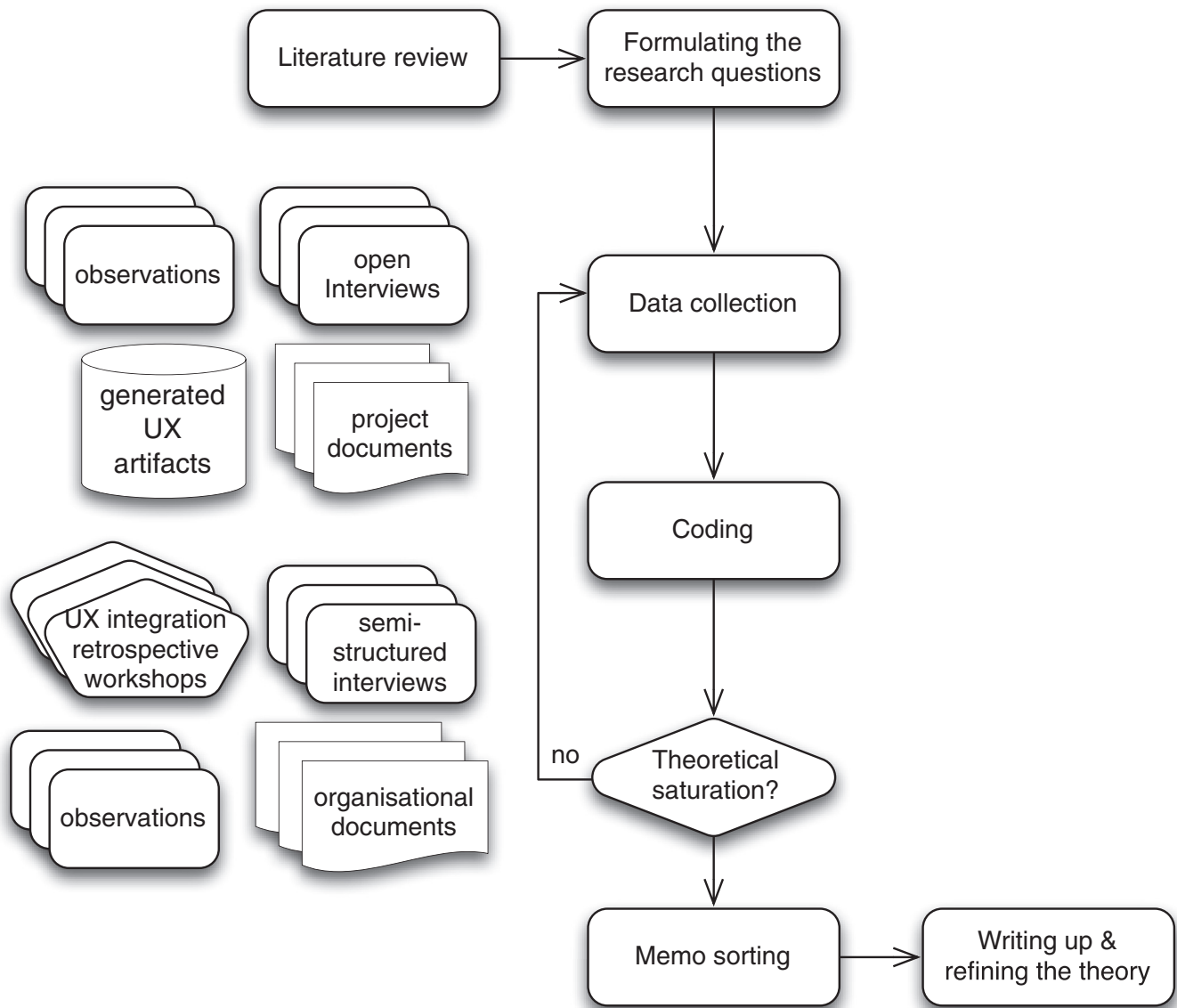

Fig. 1. In this case study, we gathered longitudinal (retrospective) data and performed a Grounded Theory (GT)-based (Strauss and Corbin, 1998) analysis of our data. We followed Strauss and Corbin's guidelines (Strauss and Corbin, 1998) to guide our data gathering and analysis.

ees, and developed software using an agile development process. This company was a suitable case for our research purpose for four main reasons. First, the company is a medium-sized software development company with various organizational units and different roles and responsibilities across them which could give us the possibility to study the influence of these units on integration over time. Second, the company's main product, which we studied, is a business-to-business (b2b) software system customized for and sold to large international corporations. Studying UX integration for a b2b software was in particular interesting for us as current literature on UX has a lopsided focus on business-to-consumer products while research shows that integration for b2b software is more challenging (Kashfi et al., 2017). Third, the company has gone through a transition from waterfall to agile software development which in our view could provide valuable insight on the influence of these approaches on integration efforts. Fourth, the company is located in Gothenburg Sweden which could give us easier and more frequent access to practitioners and other data sources.

The company is structured in three main units. The first unit is the development unit which is responsible for developing the core features of the products. UX integration initiatives are mainly performed in this unit. At the time of performing our research (2015), this unit hired a UX expert to take the responsibility of UX integration in the organization and coordinate the related activities. This unit also includes a UX guild, a volunteer group that holds weekly meetings to discuss UX-related topics such as (i) what activities are the members performing currently in their teams, (ii) what problems are they facing in relation to these activities, (iii) what specific design problems are they facing in their projects. In addition, the guild meetings involve more generic discussions about how UX integration can be improved in the organization or how UX advocates can get buy-in from other internal stakeholders in particular management. The second unit is the customization unit which is responsible for customization of the features according to the needs of each customer. The third unit is the business unit which mainly consists of product owners and product managers. This unit is in large responsible for aligning the products with business model and strategy of the company.

Data gathering

In our study, data was gathered through a collection of empirical methods including observations, interviews, document analysis and workshops, as summarized in Table 2.

The first author was located at the case company for a period of four months (Feb 2015 to June 2015) to facilitate easier access to the practitioners and data. Besides the methods described below, the first author had regular email and telephone contact with the practitioners who participated in the study.

We performed 19 interviews across the three units of the organization in two steps. At the first step, 3 open and semi-structured interviews were performed by the first author. The initial interviews were open interviews since we aimed to discover the main events that influenced UX integration over the years. This helped us explore the events related to various initiatives, activities, UX roles and responsibilities, practices, tools and methods, and artifacts. As we learned more about these events, we performed interviews to gather detail information about the main identified events.

In order to better understand and gather more information about current UX activities in the company, a number of main meetings performed by the UX expert (e.g. design studio, effect mapping workshop), and weekly meetings of the UX guild were observed by the first author. The above meetings were both audio recorded and transcribed for coding and analysis. Because we aimed to investigate the attitudes of various internal stakeholders towards the role of the UX expert and current integration efforts, in these meetings, we mainly focused on the collaboration and communication between the UX expert and the meeting participants, their reflections, reactions and perceptions rather than the outcome of the meetings, i.e. the UX artifacts.

After both meetings the first author gathered feedback of the participants via short interviews to understand how they perceived work of the UX expert and in particular the tools and methods she suggested. In addition, the first author was located in the same room as the UX expert to be able to closely observe various activities performed by this role. Regular discussions with this role also naturally happened due to this co-location.

Table 2
Data gathering methods used in this study.

Method	Quantity & Date	Description/Examples	Purpose
Interview	19 interviews: - Dec. 2014 (8) - Feb. 2015 (7) - Mar. (3) - Apr. (1)	the roles we interviewed: - management (1) - product manager (1) - product owner (5) - scrum master (2) - UX advocate/developer (3) - developer (3) - tester (1) - business analyst (2) - UX expert (1)	- identify the main events - investigate their influence on integration
Archival data analysis	organizational documents & project artifacts generated 1992–2015	- organizational charts & job descriptions - mockups - UX & usability guidelines - personas - usability reports - UX waves	- triangulate the findings of the interviews - identify the influence of various events on integration
Workshop	two workshops: - Apr. 2015 - May 2015	- the first workshop included the representatives of the three organizational units, - the second one included the UX expert	- validate & reflect on the identified events - investigate their influence on integration - identify future approaches to address the identified challenges
Observation	seven in: - Dec. 2014 (2) - Feb. 2015 (1) - Mar. 2015 (2) - Apr 2015 (1) - May 2015 (1)	- guild meetings (5) - design studio (1) - effect mapping workshop held by the UX expert (1)	- to gather data on current integration efforts - investigate the attitude of various stakeholders towards these efforts

Beside the UX expert, the UX guild was another rich source of information about current UX practices in the company. Hence, five guild meetings were also observed by the first author. The meeting discussions were recorded in form of extensive notes and the summary of the main points were distributed among the participants for validation. These observations provided rich data on how UX guild members perceived the UX challenges and success factors.

In addition, we investigated the UX artifacts generated from 1992 to 2015. The aim of this document analysis was mainly triangulation of the interview data, i.e. verify the existence of the artifacts mentioned by the interviewees or discover the ones that were missing from our data. We, therefore, did not aim to analyze the quality of these artifacts. Admittedly, such analysis could provide valuable information regarding UX integration, for instance additional explanation for why some artifacts were generated but not used. Nevertheless, we believed such a judgment required a more controlled setting and longer investigation of generation and use of these artifacts. This was therefore not feasible and out of the scope of our study. In particular, since a number of these artifacts were generated before the start of our research study.

Other sources of data were two workshops held at the company. A retrospective workshop was held in the company with participants representing the three units. The aim of the workshop was to reflect on the events identified through interviews and their influence on UX integration in the company. The UX expert was not invited to the meeting mainly to give the participants a chance to freely reflect on and share their views about her role and responsibilities, and motivations for hiring her.

A second retrospective workshop was held at the end of the data gathering. This workshop was mediated with an impartial researcher with knowledge in organizational change. In this workshop, the UX expert and the first author reflected on the factors that, in their view, had facilitated or prohibited UX integration in the company. The UX expert also reflected on her work in the company, what practices, tools and methods she had proposed, and how they were received by other stakeholders. Through these workshops we not only validated our findings but also gathered more data on the identified events and their influence on integration.

Data analysis

In this study, we performed a Grounded Theory (GT)-based (Strauss and Corbin, 1998) analysis of our data. Following the principles of Grounded Theory (GT), we simultaneously performed data gathering and analysis until we achieved theoretical saturation (Strauss and Corbin, 1998). We also performed constant *memoing* while coding the data. GT has two main different variations, Glaserian (aka. classic) (Glaser et al., 1968) and Straussian (Strauss and Corbin, 1998). These approaches differ in their steps and principles (for a comparison please see (Stol et al., 2016)). In this study, we picked Straussian version and followed Strauss and Corbin's guidelines for performing GT (Strauss and Corbin, 1998) including the following steps (Fig. 1):

- *open coding* is the step in which the concepts are identified in the data. For this purpose, the raw data (e.g., interview transcripts, or observation notes) was broken down into manageable analytical pieces. These pieces then were openly tagged with codes (i.e., concepts and categories) by identifying key points represented in the segment which included events and their enabling or prohibiting influence on integration. Our date resulted in 143 codes in this step.

- *axial coding* is the process of relating categories to their sub-categories. In this step, the generated codes were related to each other via a combination of inductive and deductive thinking to form the main categories (i.e. themes and sub-themes) of events and their enabling or prohibiting role in the integration process. The main categories, however, merely describe the data and need to be further developed into a theory. Our data resulted in 27 categories in total which resulted in forming three main themes. The themes that emerged from our data concern *UX practices and responsibilities, internal and external stakeholders' beliefs and attitude about software quality and UX, and the company's business model and strategy and how UX integration was perceived in relation to that. The sub-themes concern, for instance, managing UX practices, the role of politics in integration, the role of power-relations in integration, the relation of UX to GUI design and development, the importance of software quality in general and UX in particular, the importance of the end user needs' compared to the needs of customers, the relation of integration to value delivery, and UX being part of the business model and strategy of the organization. Further analysis of the identified categories and their impact on integration over the years showed that they spread over at least four noticeable time periods that reflect the paradigm shifts in the organization in particular in relation to the main three identified themes.* These periods, in fact, are our interpretation of the company's transition from GUI development to integrating usability and UX. A transition which was a response to various events and their enabling or prohibiting roles.

- *selective coding* is when the core category is selected from the main categories identified in axial coding. The theory is refined and developed through linking the identified categories around the core category. We realized that we have rich data on organizational change aspect of integration hence selected this aspect as our main focus to further analyze UX integration in the case company which resulted in generating 4 lessons learned and 5 pitfalls.

In presenting our results, we structure them based on the four identified time periods instead of the identified categories. In other words, we use a narrative of events to show how UX integration emerged over time, situated in its context, i.e. the organization. We present these events and their influence from the perspective of practitioners. Our main motivation was to present a coherent story of the changes in the organization, present various event, and describe their enabling or prohibiting roles through this story. In our view, such a presentation, can better show the company's journey over time which was one of the main aspects of our analysis. Therefore, we discuss the interrelation among the identified events as well as between events and the organization and show how they may have influenced UX integration positively or negatively. However, we do not argue the relative importance of these events or the extent of their impact on the integration, rather focus on whether, in general, they served as an enabler or prohibiter to integration efforts. Also, the aim of these periods is not to present an exact time box of the identified events, rather to show the paradigm shift in the company over the years.

In this study, we did not draw cause and effect relationships from the data. We rather identified indications of improvement or worsening of UX integration mainly based on the participants' opinions and our document analysis of the *UX artifacts*, i.e. tangible outputs of UX practices in projects, e.g. 'UX guideline'.

In addition, we do not provide a full coverage of all the events across the organization in the identified periods. In our analysis, we coded and categorized the events that based on our data have had an interesting impact on UX integration within the case company. Clearly, in earlier years, the term UX or even usability

were not used and these concepts to a large extent were not yet adopted in the industry. But since many of the events in those early years became the basis of UX integration in later years, we collectively refer to them as influencing events. Still, to better reflect the company's history, we have explicitly distinguished between various terminologies used in different periods.

4. Results

In this section, we present the four identified time periods or paradigm shifts (summarized in Table 3) and their including events. We found that some of the identified events happened outside the organization while some were internal to it. In the following sub-sections (i.e. time periods), we have presented the internal events according to their chronological orders. However, as our data gathering was done inside the organization, we did not have enough data to extract a reliable chronological order for the external events. These events are, therefore, presented and discussed in relation to the influence they have had on the internal events.

The identified events have a complex and multifaceted relation with the main themes and sub-themes that emerged from our data. For instance, hiring a manager with HCI background in the company could be associated to changes in business model and strategy and a positive attitude towards software quality and usability in that time. It also directly related to usability-related practices and responsibilities and also contributed to even more positive attitudes towards usability in the organization. Although we acknowledge this complex relation between the events and the themes, for each internal event (Tables 4, 6, 8, and 10), we have listed the theme that in our view had the strongest connection to the event. We believe such a categorization when summarizing the events can help the reader better understand these events and their relation to integration from various aspects.

However, for the external events, such a categorization was not possible as each external event could have influenced various internal events, hence, influenced the integration concerning more than one theme. Therefore, we used, other categories that emerged from our data with regards to the external events which concerned the nature of these events and not their influence on the organization: We identified at least three main such categories: (i) technological advances (e.g. introduction of mouse as an interaction medium), (ii) increasing knowledge and awareness (the concept of UX becoming widespread in the field of software development), and (iii) educational advances (university programs that covered UX). Please note that these external events, their order, and influence on the organization is presented as perceived by our participants.

4.1. Period one: focusing on graphical user interfaces

In this period which mainly happened between the years of 1993–2002, the company started investing in creating Graphical User Interfaces (GUIs) in response to the following changes and events. The main events that happened inside the organization are summarized in Table 4 while Table 5 summarizes the main events that happened outside the organization yet influenced the internal events and integration efforts.

The interviewees highlighted that various events external to the company impacted how internal and external stakeholders expected a software system to look like and behave. The interviews for instance mentioned introduction and plurality of mouse as an interaction medium, graphical user interfaces, and desktop and home computers. Regarding the advances in the field, a developer stated:

> "Anybody now knows what a desktop is, but when we started in 1990, nobody knew. It didn't exist as a common metaphor. Our first manual had a picture saying, 'Here's what a mouse looks like. Here is what you use the buttons for'" (p8, developer).

This interviewee further emphasized:

Table 3

We identified at least four periods or paradigm shifts in the organization that concern GUI design and development, usability, and UX. Some of the events we identified span across these periods and their presence or influence on integration was observed in more than one period. These periods, therefore, shall be seen as paradigm shifts in the organization rather than exclusive time boxes of events.

Period	Main paradigm shift
Period one	investing in creating Graphical User Interfaces (GUIs) as opposed to command-line interaction
Period two	initiating usability integration that focused on improving the developed GUI through enhancing its usability. For this purpose, principles and practices of usability were introduced to the organization and started to be integrated to the development processes (mainly through applying user-centered design (UCD))
Period three	initiating UX integration that focused on enhancing the experience delivered through the developed products. For this purpose, in addition to principles and practices of UCD (with focus on usability), UX principles and practices were introduced to the organization and started to be integrated to the development processes.UX integration covers usability integration as well
Period four	improving UX integration that focused on enabling a better UX integration in the organization through new initiatives and applying various practices

Table 4

The main internal events in period one: Focusing on Graphical User Interfaces. To help the reader, these events are listed in their chronological order and in the same order as narrated in the summary of the corresponding period.

Category	Internal events
Business model & strategy	The company entered new market areas where customers required more interactive software
Business model & strategy	The company grew in size fast
Business model & strategy	More practitioners with technical skills were hired
Business model & strategy	The company's business strategy focused on functions
Beliefs & attitudes	An engineering culture formed in the company
Practices & responsibilities	GUI designers & developers with graphical design skills were hired
Beliefs & attitudes	Developers emphasized separating the GUI layer from business logic
Beliefs & attitudes	Developers emphasized making the GUI configurable
Beliefs & attitudes	Developers emphasized enhancing fonts & colors on the GUI

Table 5

The main external events influences of which were first noticed in the organization in period one and contributed to a focus on Graphical User Interfaces (GUIs). External events indirectly influence integration as they often lead to other events inside the organization; examples of such internal events are listed in the last column. These external events are listed in the same order as the internal events they influence.

Category	External event	Example internal event
Technological advances	new interaction medium, mouse, became widespread	The software was designed for mouse interactions which created more possibilities for better UX design
Technological advances	GUI mostly replaced command-line interactions	Stakeholders became motivated to develop a software system with GUI
Technological advances	desktop & home computers became widespread	Customers & users experienced various software systems & expected better UX hence internal stakeholders became more motivated to enhance UX
Increasing Knowledge & awareness	customers & users became familiar with Windows operating system	Customers & users had higher expectations about GUIs hence internal stakeholders became more motivated to enhance UX

Table 6

The main internal influencing events in period two: Initiating Usability Integration. To help the reader, these events are listed in their chronological order and in the same order as narrated in the summary of the corresponding period.

Category	Internal events
Beliefs & attitudes	Awareness about the importance of the end users' view increased in the company
Business model & strategy	The marketing unit used UX as one of the selling points of the company's products in their advertisements
Beliefs & attitudes	Management's awareness about importance of interaction design & usability increased
Practices & responsibilities	A GUI design forum was established in the company
Practices & responsibilities	Design guidelines were created in the company
Business model & strategy	A manager with HCI background was hired
Practices & responsibilities	Specialized units in the organization were formed (e.g. core development & GUI development)
Practices & responsibilities	The gap between developers & end users increased
Practices & responsibilities	Various user-centered design practices were applied in the company
Business model & strategy	A former end-user was hired as business analyst
Business model & strategy	A GUI and visualization specialist was hired
Business model & strategy	The company was acquired by a large international company

> *"if you design a user interface today, you have to imagine that users are not going to click on a mouse, they're going to point to the screen and drag their fingers, and they expect things to work this way. Which they didn't do 20–30 years ago. So, UX design also means that you have to conform to what industry standard is today"* (p8, developer).

During these years, the company targeted new market areas, i.e. application domains, that needed more interactive products. Second, more and more developers were hired and the company grew in size. In addition, the company was mainly hiring practitioners with competences in developing core functions, and algorithms (e.g. people with backgrounds in computer science and mathematics). This hiring policy was mainly motivated by the business model and strategy of the company which focused on algorithms and offering unique core functions to the customers. Consequently, an even stronger engineering culture in the case company formed over these years. In later years, this historical focus on core functions contributed to more resistance to the concept of UX and related practices.

Still, in response to the new expectations rising in the market, and to benefit from the new technologies, the company consciously planned to improve the user interfaces of the product to enhance users" access to the core functional capabilities. Therefore, besides core developers, developers with GUI design and development skills were also hired during these years. However, the number of such developers was much less than those with core development competencies. Even practitioners hired for GUI development had technical education and backgrounds (e.g. computer science) and not Human-Computer Interaction (HCI). Similarly, the company hired much less number of developers who had a business perspective and understood the importance of

business goals and their relations to functions and GUI. Regarding this a product manager emphasized:

> *"people we hired as developers hadn't had the opportunity to be on the customer side, to understand the business value of the system and how they work as a whole and also meet with the users"* (p1, product manager).

The main focus of the hired GUI developers was to separate the GUI layer from the business logic, and to make it as configurable as possible, which was expected considering their competences and background. These developers, having limited design mindsets, believed that usability or UX is something that can be achieved through configuring fonts and colors by users after deploying the software. For instance, one of the developers explained how she approached improving the design as:

> *"the user interface is programmable. You can choose colors, you can choose sizes and, you know, fonts and things. And for me that is good enough for the user, they can choose themselves what they want [later on]"* (p8, developer).

The company took pride in the fact that their products supported mouse interaction, or that it even offered any GUI while similar products in the market offered only command-line interaction. As the interviewees stated, GUI and interaction through mouse were still uncommon and 'unexpected' for the customers and users; therefore easily created positive experiences for them. This can explain why still many practitioners in the company emphasize they have always been working with UX, for instance:

Table 7

The main external events influences of which were first noticed in the organization in period two and contributed to initiating usability integration. External events indirectly influence integration as they often lead to other events inside the organization; examples of such internal events are listed in the last column. These external events are listed in the same order as the internal events they influence.

Category	External event	Example influence
Increasing knowledge & awareness	customers paid attention to end users' opinions	Internal stakeholders became motivated about usability integration
Technological advances	mobile & web platforms became widespread	Practitioners had the opportunity to deliver different experiences through different platforms
Theoretical advances	the concept of UX influenced software industry	Internal stakeholders realized the importance of experience, as well as functions, in attracting customers
Increasing knowledge & awareness	customers & users paid attention to look & feel	Internal stakeholders became motivated to invest on look & feel became
Increasing knowledge & awareness	practitioners with usability skills became available in the job market	Practitioners who joined the company were more likely to advocate or engage in emergent usability initiatives
Educational advances	university programs with interaction design & usability focus became widespread	The company had more access to practitioners with usability knowledge who engaged in emergent usability initiatives
Educational advances	educational resources on usability (e.g.books) became widespread	Internal stakeholders had more possibility to improve their usability skills

> *"I wonder if anyone talked about UX design. But we were ahead of times. We were using pointing devices before they even called it mouse... We realized early that we need to work a little bit with GUIs"* (p7, product owner).

4.2. Period two: initiating usability integration

This period mainly happened during the years of 2003–2006 when usability integration was initiated in the company as the following events intertwined with the events in period one. Here, by usability integration we mean introducing usability principles and practices to the organization and integrating them to the development processes. This differs from period one in which the focus was on developing Graphical User Interfaces (GUI) without necessarily taking their usability into account.

The main events that happened inside the organization are summarized in Table 6 while Table 7 summarizes the main events that happened outside the organization yet influenced the internal events and integration efforts.

In this period, management and other internal stakeholders (e.g. developers, sales and marketing) realized that customers paid more attention than before to end users' opinions and views. The customers' increasing knowledge and awareness about the importance of users' opinions and views motivated the internal stakeholders to take usability into consideration. Regarding this an interviewee stated:

> *"I was working with sales a lot. [for instance] I demonstrated the system for 30 end-users. There was one manager and the manager was the one who made the end decision at the end of the day but it was pretty obvious that if 30 end-users didn't like the system, she was going to have a very tough time selling that system to them. That was one of the drivers for understanding that end-users' opinion matters"* (p6, manager).

With the advances in web and mobile technologies, the concept of UX was introduced in the field of software development. Accordingly, a marketing campaign was started in the company that advertised the products as 'a product that provides one co-herent experience for the users'. The marketing and sale units had realized that a unified experience is appealing to the customers and users and can contribute to more sells and profit. However,

in practice, this was not still the case and even the GUIs were not yet unified.

During these years, management had realized that considering the advances in the field, only providing core functions was not sufficient for the success of the product. In their view, at least a minimum level of usability in the GUIs was required in order to better succeed in the market as the customers and users paid more attention also to look and feel of software systems. Regarding this a developer stated:

> *"So from a selling perspective, I think, our manager was right saying that we have to have a good look and feel, that every-body wants a good look and feel, and our system looks a bit old and clunky"* (p8, developer).

Therefore, a GUI design forum was established where various stakeholders in both development and business units would dis-cuss the design of the GUI. Consequently, a set of guidelines were generated for developers in the GUI development teams.

In these years, the company had more access to practitioners with usability and interaction design skills in the job market. This was expected as university programs that focused on usability and interaction design became widespread. Accordingly, a director of Research and Development (R&D), with a background in Human-Computer Interaction (HCI), was hired specifically to initiate and coordinate the activities required to improve the usability of the products. For instance, through facilitating end users involvement in the process and improving interaction design of the product. It was also agreed to follow Microsoft design guidelines in develop-ing the GUIs. Many of the changes made to the GUI in this pe-riod became the base of the UX design of the products in later years.

The size of the company was now growing even more and more developers with different expertise were hired. Hence, specialized teams, units, and departments were formed to better structure and organize the responsibilities of these developers. For instance, a unit specialized in GUI development was established under R&D department in 2005. In later years, this unit became the source of many UX integration initiatives. Increasing size of the company also led to an increasing gap between developers and customers and end users. Since the number of developers was increasing, it was no longer possible for all developers to meet the customers' sites and have direct contact with the end users. Regarding this a requirement analyst/developer said:

Table 8

The main internal events in period three: Initiating UX Integration. To help the reader, these events are listed in their chronological order and in the same order as narrated in the summary of the corresponding period.

Category	Internal events
Beliefs & attitudes	The concept of UX become more known in the company
Business model & strategy	A GUI designer with UX knowledge was hired
Beliefs & attitudes	Number of UX advocates in the company increased
Beliefs & attitudes	A UX study group was established in the company
Practices & responsibilities	UX advocated run a pilot project to learn more about UCD
Beliefs & attitudes	A UX interest group was established in the company
Practices & responsibilities	Wiki pages for sharing UX-related information were created
Practices & responsibilities	User studies & evaluations were performed as part of the development processes
Practices & responsibilities	Rational Unified Process (RUP) was introduced in the company
Practices & responsibilities	UX advocates received more mandate for UX practices & responsibilities
Practices & responsibilities	UX advocates received the job title "UX designer"
Practices & responsibilities	The role of "UX lead" was introduced in the company

> "when customers were here you actually got started to talk and therefore we exchanged phone numbers and mail addresses and when you started developing you actually got feedback this way" (p13, requirements/developer).

Hence, practitioners felt a need for more formal ways of gathering information about the business scenarios and the end users' preferences. In this period, therefore, practitioners initiated applying a number of UCD practices, including user studies and user evaluations. This initiative was supported by various educational material on the topic of usability that was now available in the field of software development. Regarding this, a product manager stated:

> "Before 2006 or earlier than that, everyone was involved in implementing our systems on the customer side, everyone... During your career, you basically moved from the implementation side [where you had a chance to] meet the customer to be a more back-end developer, just developing core functions... so there was a need to have more formal practices" (p1, product manager).

Therefore, following UCD practices, user studies were performed in form of interviews and observations at the users' workplace (for different customers the organization had at the time). The result of the user studies was presented in form of unstructured text documents and included various observations, design flaws, and design improvement proposals.

The increasing size of the company also negatively impacted the quality of software in general. This could be explained by the hiring policies that, as we described before, focused on programming skills. Regarding this, a developer stated:

> "things were easier when we were fewer people. As more and more people came in, the [quality] bar was lowered because the new people didn't bring a UX mentality into the team. The general mentality is to just make it work and not to make it better UX-wise. I don't mean that they don't want to, it's just that people don't know how to, or don't think about it automatically. That's not only a problem with UX; we have that with software quality in general" (p2, developer).

Since the business units believed developers needed to better understand the business rules and how the system is being used in real situations, a previous end user was hired as a business an-

alyst. The role of this person was to be in close contact with the developers to discuss design ideas. This role, however, did not have a large impact on design, until the process changed to agile as described in the section on period four.

Another major event in this period was the acquisition of the organization by a large international company. Although in the beginning, day-to-day work of developers did not change much because of this event, in the later years, this led to other events; for instance, following new development processes that the acquiring company demanded (e.g. Rational Unified Process (RUP)[1] that mainly happened in period three and transformation to agile that mainly happened in period four as we have described in the following sections).

4.3. Period three: initiating UX integration

This period mainly happened during the years of 2007–2012 when UX integration was initiated in the company as the following events intertwined with the events in the two previous periods. The events that happened inside the organization are summarized in Table 8 while Table 9 summarizes the events that happened outside the organization yet influenced the internal events or integration efforts.

During this period, the term UX and its associated principles and practices became popular in the software industry. As university programs with a focus on UX became widespread, there were more practitioners in the job market who either already were educated on UX practices and principles or were interested in acquiring UX-related competencies. Younger generations of GUI designers and developers included graduates from HCI programs with knowledge on UX. During this period, the company also started following Rational Unified Process (RUP) as their development process. In addition, customers became informed about the concept of UX and its importance.

In this period, internal knowledge and awareness about usability and pragmatic aspects of UX increased to a great extent. The term UX was used for the first time in the company although in practice the day-to-day work was still mainly limited to practices that addressed pragmatic aspects of UX, i.e. usability practices and principles.

One of the developers that was hired in this period to join the GUI teams possessed an interaction design degree and knowledge about UX. Regarding the role of this developer in raising awareness in the company an interviewee stated:

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[1] Rational Unified Process (RUP) is an iterative software development process framework which insists that architecture sit at the heart of the project team's efforts to shape the system (Kroll and Kruchten, 2003).

Table 9

The main external events influences of which were first noticed in the organization in period three and contributed to initiating UX integration. External events indirectly influence integration as they often lead to other events inside the organization; examples of such internal events are listed in the last column. These external events are listed in the same order as the internal events they influence.

Category	External event	Example internal event
Increasing knowledge & awareness	UX became widespread in software industry & in the market	Internal & external stakeholders became familiar with the concept & benefits of UX
Educational advances	university programs with a focus on UX became widespread	The company hired practitioners with UX knowledge who advocated or engaged in emergent UX integration initiatives
Increasing knowledge & awareness	there were more practitioners in the job market who were educated/interested in UX	Company hired practitioners with UX competencies
Increasing knowledge & awareness	users & customers expected good UX	Internal stakeholders in particular management became more motivated about UX integration
Increasing knowledge & awareness	customers asked for UX-related roles in projects	Internal stakeholders in particular management became motivated to enhance UX integration

> *"She was interested in UX. She didn't work with me but I noticed that she sort of tried to pursue UX. Like 'This is something that we need to focus on.' At least it was about then that we started at least to think that there might be some other ways to solve the problems. For instance, if there's a common thing that the user does ten times more often than other things, maybe it should be easier to access"* (p2, developer).

The hired developer together with a number of other developers who got interested in UX became *UX advocates* in the company. These advocates played a major role in starting the bottom-up initiatives that contributed to increasing internal knowledge and awareness about UX and impacted UX integration in the upcoming years. However, this was mainly motivated by personal interest than responsibilities assigned by management. These UX advocates established a UX study group to learn more about UX and usability practices and principles (e.g., heuristic evaluation, personas, user studies, storyboards, and usability testing).

To exercise these practices, UX advocates ran a pilot project inside the company. They realized that these practices seemed simple but it took time to master them. Moreover, they concluded that heuristic evaluations and story-boards were easier to perform than user research and usability testing. They, therefore, started applying the former practices in their day-to-day work, only in a limited number of teams and not widespread across the organization. Following the study group, a UX interest group was established where interested developers across the organization could participate to exchange knowledge and ideas about UX, usability and related principles and practices, or UX related issues in the ongoing projects.

UX advocates also strove to increase other practitioners' knowledge and awareness about UX. They had already realized that limited knowledge and awareness about UX is a big challenge to a better UX integration in the company. Hence, in order to improve UX integration, they decided to raise the awareness especially among project managers and even customers. For instance, wiki pages were set up that included descriptions of various UX tools and methods. UX advocates also continuously strove to get a mandate from management to perform more UX practices in projects.

The reports from user studies performed in this period varied in structure and quality. While some were free text including random observations and thoughts, others were more structured including specific sections about types of users, context, work scenarios, example scenarios, etc. One explanation can be that practitioners did not yet have an agreed-upon process, tools, methods, or template to use when performing or reporting the result of the user studies. Hence, these results were dependent on the experience and knowledge of the practitioners who performed them. Another explanation may be that these practices were performed by developers who were self-taught and not formally educated in HCI, usability or UX.

In addition, UX advocates performed a heuristic evaluation of the product following Nilsen's ten heuristics. Storyboarding was another practice that became popular in the organization in this period. Not only the GUI development practitioners but also the business unit started using mock-ups and storyboards as a means of communicating requirements and design ideas. Balsamic mock-ups and storyboards were used during this period and even in later years by product management to communicate their design ideas to customers and developers, also by requirements analysts to communicate with users and customers.

In this period, the company's software development process changed from waterfall to a customized version of Rational Unified Process (RUP). This change was initiated by higher management and led to getting more mandate for UX practices since a number of these practices were explicitly considered as part of this process. These practices mainly addressed the pragmatic aspect of UX, and included: Stakeholder Analysis, User & Domain Analysis, UX Design Vision, Form & Behavior Specification, and Usability Evaluation Plan & Report. They also applied practices such as User & Domain Analysis, Storyboarding, Heuristic Evaluation, and Usability Evaluation. Despite these changes, practitioners from the business unit (including product management and requirement analysts) were still the gateway to customers and the end users. This was problematic for UX advocates since this unit still resisted UX practices emphasizing that UX is less important than functions. Another problem was that various internal stakeholders still did not differentiate customers and end users.

Following the increased internal knowledge and awareness, also the process change to RUP, the UX advocates received new job titles: UX designer. An interviewee emphasized these practitioners received the title mainly because they were more interested in UX and were involved in developing GUIs:

> *"Because they were working with the user interface. There was a lot of people working with that, but they maybe were the most interested people, and actually cared more about it. So they were the ones who were mentioned as the UX designers"* (p5, product owner).

Despite the title changes, the everyday work of these practitioners did not change much and was still mainly developing GUI:

> *"we were sitting in some kind of meeting and some people started saying that we have some UX designers, and first I was asking, 'What is UX design?' Then when people explained it to*

> *me I said, 'Wow! Do we have that?' Until I realized it was some of our developers we gave another title. At that point, it wasn't so much different in the way we worked, but the way people started talking about it was different because someday we'd call some people UX designers"* (p5, product owner).

In addition, the responsibilities of UX designers were not well defined and still largely overlapped the work of requirements analysts. Moreover, it was not clear how these roles should collaborate with each other. Another problem was the limited UX knowledge and competences in the company:

> *"cause you have creative very good front-end developers so they want to get involved in UX work, but if they do not have the needed UX knowledge then you will not have a better UX either"* (p11, UX expert).

In this period, customers and users expected good UX in the products. Customers even asked for specific roles in the projects, e.g. UX lead, to ensure supporting experience of the users. Consequently, in addition to the new role of UX designer, two other roles were defined in this period: general UX lead and project UX lead. General UX lead was responsible to present and negotiate the scenarios and initial storyboards with customers to get feedback. Project UX lead had a similar responsibility in sub-projects:

> *"The focus of this role was primarily to coordinate the UX aspect of various sub-projects running towards customer X, focusing a lot on look-and-feel, being the contact person, aligning the design in sub-projects. She was also the speaking partner towards the product development for discussing UX guidelines"* (p19, manager).

The UX lead roles, however, were not well received by the UX advocates mainly because of disagreements on the way of working. Regarding this, one of these advocates stated:

> *"the UX lead was more or less a person that follows the rules, I mean if there are 10 steps that you should make she will make all the 10 steps. So in RUP, for instance, she wanted to produce all these artifacts even if they were not needed, she did not have a very 'lean' mindset. So it was a little bit of clash in our ways of working"* (p9, UX guild, scrum master).

Another main reason was that these UX advocates felt 'left out' after the role of UX lead was introduced:

> *"we had worked with UX for many years. But the first thing she wanted to do was performing a user study, and that's Ok but she actually book it and went there alone. You should be 2–3 people to go there and observe the users. But she thought since she was the lead UX person, she should do it alone. And then she has the knowledge and she should tell us how to design. But we have been part of UX work for many years, we know how it works and it's not new to us. I mean, you don't have to reinvent the wheel"* (p10, UX guild, developer).

4.4. Period four: improving UX integration

This period mainly happened during the years of 2012–2015. Efforts to improve UX integration continued in the company during this period as the following events intertwined with the events in the three previous periods. The events that happened inside the organization are summarized in Table 10 while Table 11 summarizes the events that happened outside the organization yet influenced the internal events or integration efforts.

According to our data, the hiring policy in the case company still emphasizes technical and programming skills. Regarding this, a developer told us:

> *"When people are hired, they're not hired because they know how to design good user interfaces. They're rather hired because they know data structures and how to write code"* (p2, developer).

However, according to the UX expert, the company could benefit from more front-end developers since its product offered a variety of graphical user interfaces (GUI):

> *"it is a front-end product so it needs more front-end people. I think we would benefit from more front-end developers because it is a lot of back-end people in there"* (p11, UX expert).

In this period, practitioners had access to variety of UX educational material, to learn how to improve UX integration in the company. For instance, in the UX study group though a book on *Lean UX* (Gothelf and Seiden, 2013) the advocates learned more about how UX practices can create revenue with fewer costs. Nevertheless, these practitioners did not still get the mandate to operationalize the process of Lean UX in their work.

Table 10
The main internal events in period four: Improving UX Integration. To help the reader, these events are listed in their chronological order and in the same order as narrated in the summary of the corresponding period.

Category	Internal events
Practices & responsibilities	The company started using agile processes
Beliefs & attitudes	UX advocates learned about lean UX in the UX study group
Practices & responsibilities	Guild & chapters (including the UX guild) were created in the company as part of agile transformation
Practices & responsibilities	Feature teams were created as part of agile transformation
Practices & responsibilities	UX backlog was created as part of agile transformation
Business model & strategy	A UX expert was hired
Practices & responsibilities	UX-specific tools & methods were applied
Practices & responsibilities	UX guidelines were created
Business mode & strategy	An off-the-shelf product was created

Table 11
The main external events influences of which were first noticed in period four and contributed to improving UX Integration. External events indirectly influence integration as they often lead to other events inside the organization; examples of such internal events are listed in the last column. These external events are listed in the same order as the internal events they influence.

Category	External events	Example internal event
Educational advances	educational resources on UX (e.g. books) became widespread	Internal stakeholders could enhance their UX knowledge
Theoretical advances	agile processes became widespread in the industry	The company applied an agile development process
Increasing knowledge & awareness	practitioners with UX-related skills became more available in the job market	The company could hire practitioners for UX-specific roles
Increasing knowledge & awareness	differences between UX & usability gained the attention of various stakeholders	Practitioners advocated addressing UX as well as usability
Theoretical advances	industry relevant UX tools & methods were introduced	Practitioners had access to variety of tools & methods to address UX in their daily work
Technological advances	mobile platforms (e.g. iPhone and iPad) became widespread	Experiences with mobile applications became part of daily life of end users & provided more marketing opportunities for the company

In this period, in response to the popularity of agile processes in the software industry, the organization became agile. Consequently, feature teams, guilds, and chapters were created in this period. Each feature team was a cross-functional team, consisting of practitioners with different competencies (e.g. testing, architecture, UX). Each team was responsible for designing and developing a collection of features from core functions to GUI. Since competencies were spread across feature teams, there was a need for alignment. Guilds and chapters are organizational entities that supported alignment of various areas of competency such as testing, architecture, and UX. The main differences between a guild and chapter were that: (i) having a representative in a guild was not mandatory for all teams and projects while joining a chapter was, (ii) while chapters had decision power and authority, a guild did not have decision making power and decisions made in the guild, e.g. UX guidelines, were 'recommendations' that other practitioners could choose to follow or not.

During this transformation, UX advocates struggled to form a UX chapter instead of a UX guild. However, higher management, product management, and product owners did not support this idea and the UX study group was turned into a guild and not a chapter. One main reason why a UX chapter was not formed was a lack of competences to lead such a unit. Regarding this a manager stated:

> *"In order to have a UX chapter, there needs to be a person to lead that. When I look internally at some skills required for that, I don't think that we have the right person that I would feel comfortable leading the chapter, to be honest. I think we have some talented UI developers that also care a lot about UX but they don't necessarily have the leadership skills or negotiation skills required"* (p6, manager).

In this period, the UX advocates in the company continued performing heuristic evaluations and creating storyboards for different features. They also performed more user observations and kept the UX guidelines up to date. These guidelines, however, were not followed in all the teams, but only those who had a representative in the guild. UX practices were also mainly performed in those teams where a UX advocate was present.

Scrum methodology was selected as the agile methodology to follow. Consequently, a UX backlog was created in JIRA[2], the agile project management tool the company used. The aim was to explicitly include UX design issues in agile iterations. This was however not well received by product owners since in their view

discussions about UX issues often were not constructive and no decision could be made because of the subjectivity of the matter. Regarding this a product manager said:

> *"Some of the processes which we decided upon to use actually made the development process so very very long because no one could take a decision"* (p1, product manager).

This led to a frustration also among the UX guild members because as they stressed, even though they performed evaluations, UX issues did not get priority in the backlog and were left mostly unattended. Regarding this one of the UX advocates said:

> *"we have just given up because it is no use in doing user testing if you don't care about the results. Because once we finish the user testing we already have burned all the money for the feature, so you don't get the time and money to go back and fix it. we don't do this iterative development, we just do small waterfalls"* (p9, UX guild member/scrum master).

Another consequence of transforming to agile processes was the change of power relations between developers and product owners. Product owners now had more power to make decisions about what features to develop and in what way. However, this change was not in favor of UX since these product owners did not have the necessary UX mindset or did not even value UX. Regarding this, a manager stated:

> *"at the end of the day we're trying to be more and more agile, and we work a lot with product owners. Product owners are the ones who would accept or decline a certain function and you need to get UX awareness as well to the level where product owner will be ready to decline a function because it doesn't fulfill the UX aspects in a good way; we're far away from there… [today] that judgment or that assessment will be based on their own personal experience not being trained or educated in UX. A lot of that will be shaped by what they're used to seeing and what they're used to seeing is our old products. So, we need to raise awareness not only within development teams but also on the business side"* (p6, manager).

As this interviewee emphasized that to improve UX practices in agile, there is a need to increase knowledge and awareness also

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[2] https://atlassian.com.

among product owners and product managers because these roles are calling the shots regarding design decisions.

Comparing the current situation to earlier years when developers had more power in making such decisions, a product owner told us:

> *"Before 2010, our business expert, a former end user, had so many discussions about UX with developers, and their response was like, 'Okay, now we heard what you said,' Then they still implemented what they had in their own head anyway, because it was really the power of the developers at that point. And that was something which changed as the product owner role came in because now we own the requirement and now product owners are the ones signing off that"* (p4, product owner).

However, product owner authority was not necessarily in favor of UX:

> *"the product owner shouldn't decide exactly how it should be done. She should decide what the thing should do when it is done, not exactly how the buttons should be laid out or how it's supposed to be implemented"* (p2, developer).

During this period, practitioners with UX-related skills became available and accessible in the job market. In addition, differences between UX and usability gained the attention of various internal and external stakeholders. Consequently, as an effort to improve UX practices, an interaction designer was hired by management to join the internal UX advocates to improve UX delivered through the products. Management was looking for an expert who not only had knowledge and experience on UX practices and principles but also could balance them with technical feasibility. Management was also looking for someone who could provide leadership and direction for all aspects of the UX vision and strategy. Most importantly, the UX expert was expected to collaborate with a wide variety of different roles including customers, product managers, and developers. The UX expert was hired as part of the architecture chapter to contribute to one of the missions of the chapter: improving quality of the products.

Hiring a UX expert, however, was not fully successful for at least two main reasons. First, the expectations from this role were unrealistic. A product owner for instance expressed:

> *"I thought more that there are some basic things that you know if you are an interaction designer, and it felt like there was nothing like that. It was really depending on understanding the end users, and so on. I was a little bit disappointed... I know when we talk about UX, we're talking about seeing how end users work and everything ... [so] just forget about bringing someone in, because how would they then know if they didn't work in this domain before, because then it would take such a long time to actually get them up and running, and really provide some value"* (p4, product owner).

Second, the context in which the UX expert could effectively apply her competences did not still exist in the organization. For instance, she did not have the opportunity to collaborate enough with the relevant product owners to discuss design ideas mainly because no specific time was assigned to this collaboration.

In this period, variety of tools & methods to address UX were available to the software development practitioners. For instance, the UX expert introduced new practices, tools, and methods including business impact map, UX wave lines, proto-personas. These tools and methods were clearly closer to UX than usability, however still mostly addressing the pragmatic aspect of UX. The personas, for instance, were different from the existing ones in that they included not only the work goal but also more personal goals of users: e.g. I want to make my staff happy. Still, the majority of the needs or goals included in these personas were still pragmatic: e.g. manual override, visible calculations. The UX expert also aimed to educate not only the UX advocates but also product owners and product management.

One major problem that the UX expert felt during her work at the company was lack of collaboration with product owners and product management and that her role was not agreed upon and communicated to other stakeholders in the company. For instance, the role was going to be hired as part of the development unit while the business unit believed they do not have a need for such a role yet, and if they did, it should have been the business unit hiring a UX expert and owning UX practices in the company. Similarly, the UX advocates (i.e. UX guild members) felt uninformed about how such a role was going to collaborate with them. Mobile platforms were more popular and widespread in the industry during this period. The members of the business unit believed UX was more the focus of mobile and web products and in fact part of the business strategy to attract more end users (and customers). They, therefore, did not see a need for investing on UX for the desktop products. On the contrary, the development unit believed UX was also important for the desktop as a part of quality improvement efforts.

The newly hired UX expert felt similar problems in her work as the previous interaction design consultants that were hired in previous periods of time. She found herself in a context that was not yet ready for the practices she could offer. She introduced more UX practices and principles but they did not become widespread and were resisted mainly by product management and product owners. In general, product managers and product owners believed UX practices and processes often were time-consuming mainly because it was hard to agree on them or their outcomes. Regarding this a product manager said:

> *"We have tried different processes I think since 2009 one thing which always failed is that we didn't define who has the final say, who can actually decide what to do and how. I think we still have different views here in the organization, unfortunately"* (p1, product manager).

Similarly, a requirement analyst expressed that negative previous experiences had caused frustration in the company hence more resistance to UX integration. He emphasized:

> *"many people here like UX design but are tired of all these discussions"* (p13, requirements/developer).

Another major event during this period was that the company started developing an off-the-shelf version of its product. Product management and product owners, therefore, became more keen on features and design ideas that would mainly benefit this product than specific customers. As one product owner emphasized:

Table 12
Different types of events that may influence UX integration.

Type of event	Examples
Internal events reside within the borders of the company	Changes in the organizational structure or development processes
External events reside outside the borders of the company	Educational (e.g. courses), theoretical (e.g. tools & methods), & technological advances (touch-screen interactions); increasing knowledge & awareness in the community
Direct events explicitly & directly change UX integration in the company	Introducing new UX-related roles & responsibilities
Indirect events influence UX integration although this is not their main purpose	Changes in the development process from waterfall to agile
Planned events are all internal events & planned (aka. top-down) change initiatives designed to influence UX integration	Assigning a new head of R&D to improve UX integration in the company
Emergent events are all internal events & grass-root (aka. bottom-up) change initiatives performed to influence UX integration	Establishing UX meetings by a number of UX advocates in the company

Table 13
Gaps in current literature and their relation to the identified lessons learned and pitfalls.

Literature Gap	Lessons learned and pitfalls
Current studies often do not differentiate UX and usability or address how these differences can impact day-to-day work of practitioners or integration efforts (e.g (Ardito et al., 2014; Federoff and Courage, 2009; Lanzilotti et al., 2015)). In addition, the existing limited number of longitudinal studies often only focus on usability or UCD practices in general or do not clearly differentiate them from UX and UX integration (e.g. (Cajander et al., 2010; 2014; Federoff and Courage, 2009; Gulliksen et al., 2009))	To ensure moving beyond usability to also addressing UX, organizations shall prevent various pitfalls that concern the differences between UX and usability: *Blind transition, Saying UX but doing usability, Associating UX only to GUI*
Current studies rarely focus on communication and collaboration between UX and non-UX practitioners or among UX practitioners. In addition, current studies often associate the resistance to integration with non-UX practitioners, their mindsets, and work priorities (e.g. (Bak et al., 2008; Rosenbaum et al., 2000))	The resistance to UX integration initiatives is not shown merely by non-UX practitioners but also UX practitioners. In addition, organizations shall prevent *Striving for the sole ownership of UX* and advocate shared ownership to improve the communication and collaboration between UX and non-UX practitioners
Current studies often mainly report on a snapshot of integration and do not investigate it from a longitudinal perspective (e.g (Gulliksen et al., 2004; Rosenbaum et al., 2000; Venturi et al., 2006))	Presence and severity of success factors and challenges to UX integration may change over time and are in fact influenced by the strategies to enable or prohibit them
Current studies often mainly focus on internal, planned and direct events (e.g (Cajander et al., 2010; 2014; Eriksson et al., 2008; Federoff and Courage, 2009; Gulliksen et al., 2009; Winter and Rönkkö, 2010))	Achieving a sustainable UX integration does not merely depend on adopting UX principles and practices through direct and planned initiatives. It additionally depends on both emergent change initiatives inside the organization and external events that may indirectly influence integration
Only a limited number of current studies investigate integration from an organizational change perspective (e.g (Gulliksen et al., 2009; Winter et al., 2014))	UX integration is a type of organizational change hence to increase the effectiveness and success of their initiatives, researchers and practitioners should apply the already existing guidelines on how to better implement changes in organizations. However, for moving beyond usability to UX in their change initiatives, organizations shall prevent *Taking pride in the past GUI or usability achievements*

> *"the core is going to be given to a lot of other customers"* (p4, product owner)

Therefore the product owners would not necessarily listen to users' wishes if that could impact the core features or design of the off-the-shelf product.

We finalized our research collaboration with the company in 2015 when the efforts to improve UX integration were still ongoing, and a satisfactory level of UX integration was not yet achieved.

5. Discussion

In this paper, we presented a case study of how a software development company, over the years, may move from merely developing GUIs to also considering usability and more recently UX. Our aim was to answer the following research question: *How does UX integration unfold over time within the context of an organization? And, what are the main intertwining events that impact UX integration as it unfolds?*

Our findings show that UX integration unfolds over time through an interplay among various events that differ in their nature and origins: (i) internal and external, (ii) direct and indirect, (iii) planned and emergent (see Table 12). As we mentioned
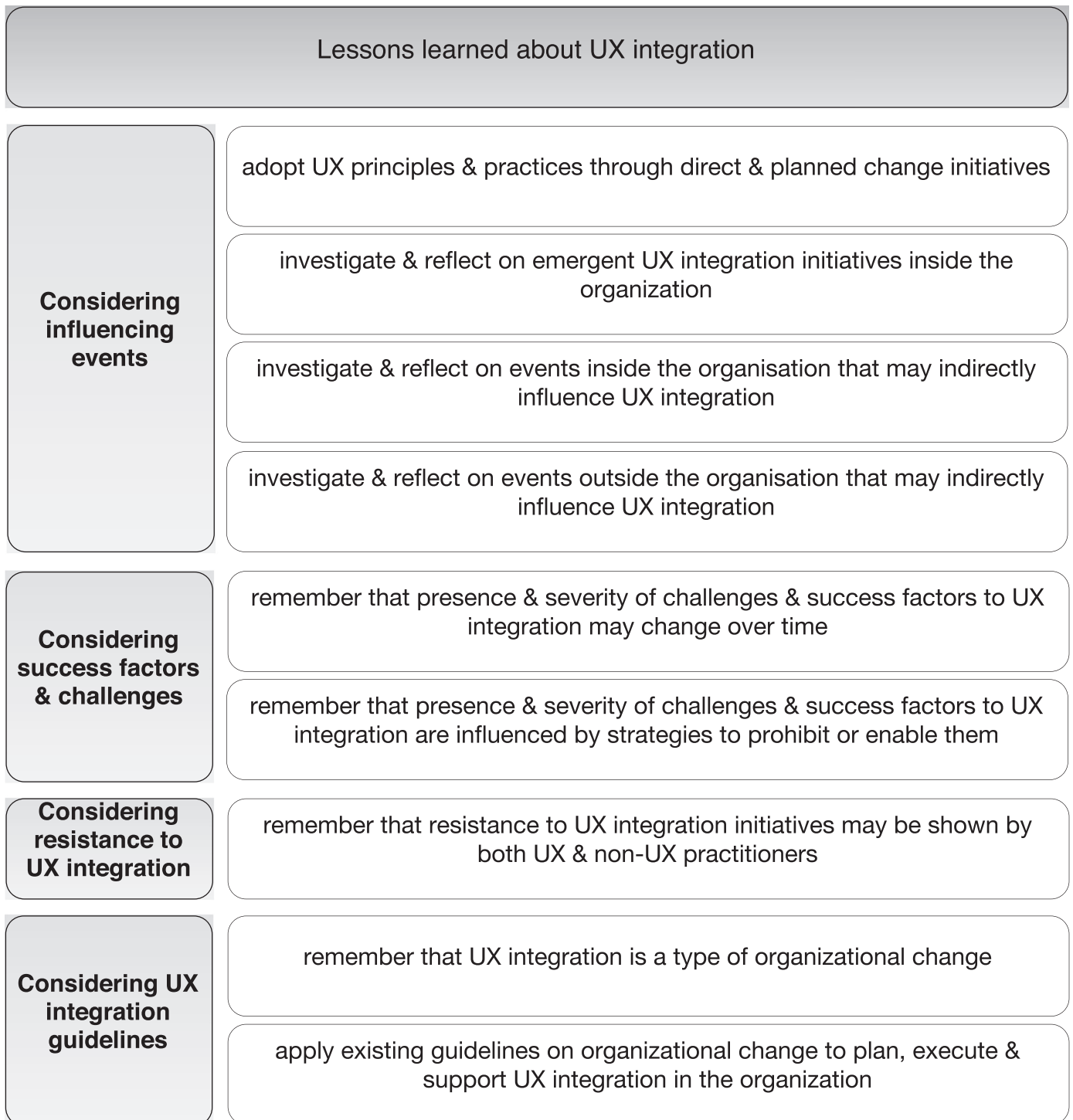
before, these events (Tables 4–11) relate to the three main identified themes and clearly have a multifaceted and complex set of relations with these themes.

Through better understanding these events and their enabling or prohibiting role with regards to integration and more specifically the identified themes, we identified 4 lessons learned that concern the organizational change aspect of UX integration. Furthermore, we explicitly investigated the transition from usability integration to UX integration and identified 5 pitfalls companies should avoid if they want to go beyond usability integration and also address UX. As Table 13 summarizes, the identified lessons learned and pitfalls bridge existing gaps in current literature on UX integration.

5.1. Lessons learned concerning UX integration

The following lessons learned merged from our data analysis and should be taken into account by practitioners to better adjust their integration efforts and by researchers to define more industry-relevant research. These lessons learned underline the importance of the organizational aspect of UX integration and in particular its organizational change nature. These lessons learned are summarized in Fig. 2 and elaborated below.

Lessons Learned 1: Considering the influencing events *Achieving a sustainable UX integration does not merely depend on adopt-*

Lessons learned about UX integration

Considering influencing events

- adopt UX principles & practices through direct & planned change initiatives
- investigate & reflect on emergent UX integration initiatives inside the organization
- investigate & reflect on events inside the organisation that may indirectly influence UX integration
- investigate & reflect on events outside the organisation that may indirectly influence UX integration

Considering success factors & challenges

- remember that presence & severity of challenges & success factors to UX integration may change over time
- remember that presence & severity of challenges & success factors to UX integration are influenced by strategies to prohibit or enable them

Considering resistance to UX integration

- remember that resistance to UX integration initiatives may be shown by both UX & non-UX practitioners

Considering UX integration guidelines

- remember that UX integration is a type of organizational change
- apply existing guidelines on organizational change to plan, execute & support UX integration in the organization

Fig. 2. We identified four lessons learned on UX integration (listed to the left of the picture). On the right, we present our recommendations for practitioners based on these lessons learned.

ing UX principles and practices through direct and planned initiatives. It additionally depends on emergent change initiatives inside the organization and also external events that may indirectly influence integration.

Current studies on UX integration often mainly focus on internal, planned and direct events. Examples are action research studies (Cajander et al., 2010; 2014; Eriksson et al., 2008; Federoff and Courage, 2009; Gulliksen et al., 2009; Winter and Rönkkö, 2010). Admittedly, such studies provide valuable insight about how practitioners can plan and execute their efforts for improving UX integration in their companies. Nevertheless, such limited focus can give a distorted image of UX integration, how it may have evolved in the complex context of organizations, and its associated challenges and success factors. Our study contributes to the current body of knowledge on UX integration through providing a more realistic and comprehensive image of these intertwining factors of various types and natures.

The fact that literature mainly focuses on planned UX integration initiatives is expected as traditionally the planned approach to change has been perceived to be more common even in the literature on organizational change (Burnes, 2004). More recent studies, however, show that planned and emergent approaches to change are complementary rather than competing (Burnes, 2004). These studies, therefore, recommend that instead of focusing on one best approach, organizations should seek to identify the approach which is best suited to certain changes they wish to undertake in their specific organizational context (Burnes, 2004). In case of UX integration, for instance, for establishing new organizational units to support UX integration a planned approach may be more suitable while for introducing new UX practices an emergent approach.

To better support practitioners, researchers can develop empirically supported guidelines to evaluate the effectiveness of, and therefore choose among, planned or emergent approaches. The guidelines can, for instance, include a map between different organizational characteristics, different changes required to support UX integration, and effectiveness of emergent or planned approaches for these changes. Most importantly, this map should include common changes that are required to support a transition from usability integration to UX integration in organizations. The work of Iivari (2006) is one example of such guidelines. Their guideline maps different types of cultures and tools and methods for usability work. For instance, they suggest that a hierarchical culture requires tools and methods that emphasize rules, standard procedures, documentation, and control. On the contrary, a rational culture requires tools and methods that emphasize measurement and cost-benefit analyses that show the business benefits of the change efforts. To create such guidelines, our work can be extended by future empirical studies on identifying common emergent and planned events that influence UX integration in various organizational contexts with different characteristics, e.g., size, structure, culture, leadership style, etc.

> **Lessons Learned 2: Considering success factors & challenges** *Presence and severity of success factors and challenges to UX integration may change over time and are in fact influenced by the strategies to enable or prohibit them.*

As an example, the extent of resistance to UX changed in the case company over time and was influenced by a verity of internal and external events. Current literature, however, often portrays resistance to UX integration as a static phenomenon that is mainly rooted in the differences between the two fields of HCI and SE (e.g. Rosenbaum et al., 2000). By understanding how these success factors and challenges are formed and changed over time in response to different internal and external factors, practitioners have more possibility to adjust their integration initiatives and strategies in different periods of time depending on the severity and the extent of success factors or challenges in these periods. We, therefore, suggest future research to analyze UX challenges and success factors from a more dynamic and longitudinal perspective.

> **Lessons Learned 3: Considering the resistance to UX integration** *The resistance to UX integration initiatives is not showed merely by non-UX practitioners but also UX practitioners.*

We found that the showed resistance to UX integration in the organization was not limited to non-UX practitioners, or as previous studies call it only a result of developers' mindsets and work priorities (Bak et al., 2008; Rosenbaum et al., 2000). A resistance was also shown by UX advocates who were involved in bottom-up integration initiatives. There was also an obvious power-struggle between this group of practitioners and practitioners with new roles or competences assigned by management to improve UX integration. To the best of our knowledge, this type of resistance and power-struggle is merely explored in current UX integration literature. One explanation for such resistance and power-struggle can be the clash between emergent and planned initiatives. For instance, when management assigns roles to handle UX integration, those practitioners who have been involved in emergent events (i.e., bottom-up initiatives) may feel to some extent 'left-out' in the new planned programs to change. To overcome such a challenge, organizations should, for instance, better investigate previous emergent changes and better align them with planned ones. This further underlines the importance of taking various types of factors into account when investigating and planning UX integration in organizations, as elaborated above. Similar to the above insights we gained on resistance, other challenges to UX integration can also be analyzed better in their context, and from a more dynamic and longitudinal perspective.

> **Lessons Learned 4: Considering UX integration guidelines** *UX integration is a type of organizational change hence to increase the effectiveness and success of their initiatives, researchers and practitioners should apply the already existing guidelines on how to better implement changes in organizations.*

Through identifying and analyzing various types of factors that influence UX integration, we highlight the fact that UX integration is, in fact, a type of organizational change. Nevertheless, so far, only a limited number of studies have investigated UX integration in its socio-technical context and through the lens of organizational change. Usability researchers (Iivari, 2006; Rönkkö et al., 2008; Winter et al., 2014) emphasize that by understanding the change nature of usability integration, practitioners can better address related organizational issues, e.g., organizational culture, management commitment to changes, or communication and collaboration between designers and developers; we expect similar benefits in case of UX integration.

5.2. Pitfalls in transition from usability to UX integration

Current studies often do not reflect on the transition from usability to UX and how this transition happens over time in an interaction with various factors inside and outside the organizations. Here, we explicitly differentiated UX and usability concepts, investigated the company's transition in the last years, and accordingly identified 5 pitfalls regarding the transition. These pitfalls can negatively impact integration efforts in organizations and prevent achieving a sustainable UX integration. The pitfalls and proposals on how to overcome them are summarized in Fig. 3 and elaborated below.

> **Pitfall 1: Blind transition from usability to UX** *Transition between GUI development to usability and then from usability to UX may not be explicit and clear enough, meaning that differences and implications of new concepts are not discussed during the transition nor disseminated among internal stakeholders to raise awareness and get support. The transition also may suffer from lack of reflection on and learning from past events influencing the transition.*

As our case study shows, being influenced by the changes in the field of SE and HCI, companies go through different stages before achieving a suitable level of UX integration. However, in the rush to adopt emerging concepts such as UX, practitioners may fail to sufficiently become aware of the implications these concepts have for their organizations and processes. To avoid a blind transition, and instead undergo a more informed transition, we suggest organizations to not only pay attention to the differences and similarities as well as implications of these concepts but also to reflect on and learn from past integration efforts, whether successful or not. Such reflection is known to facilitate better plan-

Pitfalls in transitioning from usability to UX integration		How to overcome?
Blind transition from usability to UX	failing to raise awareness about relations between UX & other relevant concepts	discuss & disseminate the differences & similarities between UX, usability & GUI design
	failing to address the implications of differences between UX & other relevant concepts	take into account the implications of these similarities & differences
	failing to reflect on & learn from previous integration efforts	reflect on & learn from past integration efforts, whether successful or not
Saying UX but doing usability	lopsided focus on the pragmatic aspect of UX	give mandate to UX advocates to extend their activities to address the hedonic aspect as well
	applying generic UCD practices without attention to characteristics of UX	extend UCD practices to go beyond usability & coordinate among various units to ensure a coherent UX
	lacking practitioners with knowledge on the hedonic aspect of UX	hire practitioners with knowledge on both pragmatic & hedonic aspects of UX
Associating UX only to GUI	pay more attention to who the advocates are than what UX really is	raise awareness about the relation of UX to service design, business strategy & innovation
Striving for the sole ownership of UX	various stakeholders from different disciplines struggling to gain the sole ownership of UX	advocate & facilitate a shared ownership of UX
		create a respectful attitude among disciplines
		adovate & facilitate a close collaboration between UX & non-UX practitioners
Taking pride in the past GUI or usability achievements	taking pride in previous achievements in GUI design or usability	remember good UX means delivering both satisfaction & pleasure (delivering expected & unexpected)
	considering current UX good-enough through relying on past user feedback	consider current & future user needs & competitions in the market to deliver both expected & unexpected
	down-prioritizing UX integration because of relying on past achievements	iteratively evaluate & enhance UX to satisfy the ever-changing user needs & to deliver 'unexpected'

Fig. 3. The identified pitfalls in UX integration and proposed strategies to overcome them.

ning for and acting on future efforts and increase the likelihood of their success (Cajander et al., 2010; 2014; Dingsøyr et al., 2007).

Pitfall 2: Saying UX but doing usability *Organizations may have the intention and ambition to address UX in their practices however in reality their practices may still only remain usability-focused.*

This pitfall is a more specific instance of blind transition and may happen as a result of overlooking the differences between UX and usability, and consequently their integration into organizations. This pitfall can result in a lopsided focus on the pragmatic aspect of UX which has been highlighted by previous research (Väänänen-Vainio-Mattila et al., 2008). Simply applying generic UCD practices without careful attention to, and being committed to addressing differences between UX and usability does not necessarily result in a better UX integration. UCD, for instance, recommends identifying the end users' personal needs, but without knowledge on various human emotional needs (e.g curiosity, connectedness), a practitioner may not be able to discover such needs and is likely to only focus on usability needs of users (e.g. learnability, error prevention). Therefore, UCD practices should be performed by practitioners who have sufficient knowledge about these differences and the required competencies to support the whole scope of UX rather than only its pragmatic aspect, i.e. usability. To go beyond usability, UX advocates should get enough mandate to extend their activities otherwise, as we saw, they may only be able to continue usability work in spite of their ambition for UX. Most importantly, the organization should see a need to support not only the pragmatic but also the hedonic aspect of UX. Organizations that want to incorporate UX should pay enough attention to how it differs from usability or other similar concepts. This helps to more effectively benefit from addressing this concept in their products and services and to go beyond usability.

Pitfall 3: Associating UX only to GUI *UX may be perceived by stakeholders as a concept only concerned with GUI because the concept of UX has its roots in the field of HCI which has traditionally been associated with GUI design and look and feel.*

Various stakeholders may limit UX as a concept merely concerned with GUI design. As our findings show, the fact that UX advocates in the company were mainly GUI developers further contributed to this association. As we saw, a main consequence of limiting UX only to GUI design is to down-prioritize it in the organization. However, the field of HCI is much broader in scope than only look and feel of the GUI and usability of the products and services (Hassenzahl, 2003). UX is also known to be associated with service design (Goldstein et al., 2002; Pine and Gilmore, 1998), business strategy (Marcus et al., 2009; Sward and Macarthur, 2007) and innovation in organizations (Hoonhout et al., 2012; Roto et al., 2016; Treviranus, 2009). Therefore, to avoid this pitfall, organizations need to increase knowledge and awareness about the role of UX in the above topics and emphasize that UX is not only about GUI design and aesthetics but also directly related to value delivery to customers and end users.

Pitfal 4: Striving for the sole ownership of UX *Different groups of internal stakeholders with different areas of competencies may strive for the sole instead of a shared ownership.*

It is expected to observe a power-struggle among various groups of practitioners concerning the ownership of UX. UX practices are multidisciplinary in nature and overlap with the work of practitioners in various disciplines such as business, sales and marketing, and requirements, among others (Hartson and Pyla, 2012). Therefore, we agree with those researchers and practitioners that advocate a shared ownership of UX (Bogaards and Priester, 2005; Gabriel-Petit, 2005). Successful UX integration necessitates close cooperation between UX and non-UX practitioners to ensure common goals. For instance, in agile settings, this requires taking the UX practices schedule into account when ordering the task list (Kuusinen and Väänänen-Vainio-Mattila, 2012). Moreover, enabling such approach necessitates respectful attitude between disciplines (Ferreira et al., 2012).

Pitfall 5: Taking pride in the past GUI or usability achievements *Internal stakeholders may take pride in their previous achievements in GUI design and development, or usability. These practitioners, therefore, may down-prioritize UX integration, or efforts to improve UX design of the products.*

Delivering a good UX often requires not only taking the expectations of users into account and satisfying them but also delivering pleasure to the users through providing unexpected features and qualities (Hassenzahl, 2003). Expectations of users are not static rather dynamic and influenced by various other external events, for instance introducing new interaction medium or being exposed to other products with better UX (Hassenzahl, 2003; Pine and Gilmore, 1998). Hence, although an organization may successfully deliver good UX to its end users in certain time periods, its success may fade away over time. Organizations, therefore, cannot rely on their previous success, and instead, require to constantly investigate and enhance the UX delivered through their products to address changes in users' needs and expectations in response to various external events. This is important for the business success of companies as nowadays, many companies compete on the basis of providing a better UX and not merely usability or functions (Hassenzahl, 2010; Pine and Gilmore, 1998).

5.3. Limitations and threats to validity

Threats to validity are outlined and discussed based on the classification by Runeson and Höst (2008) that includes four threats to case study research, namely, construct validity, internal validity, external validity, and reliability. Runeson and Höst acknowledge that the above terms are usually used in controlled experiments. Nevertheless, they operationalize these categories of threats for case studies instead of applying other terms (e.g. credibility, transferability, dependability, confirmability).

Construct validity concerns whether the studied phenomenon is relevant to validly address the research questions and whether the operational measures that are studied really represent what the researcher have in mind. In the case of our study, the aim was to gather data on the company's integration journey over the last years and study how various events positively or negatively influenced integration. This was achieved through interviewing various practitioners, observations, workshops, and document analysis. Applying various data gathering methods helped improving construct validity of our study.

However, to prevent this threat, it was also important to select practitioners that have been present during various studied events. We selected the interviewees together with our main collaborators in the company and based on these criteria: work experience in the company, current and previous roles, and attitude towards UX integration (both positive and negative). We also provided a written description of the interviewees we were looking for to avoid any misunderstandings regarding the criteria. As we were interested in the events that happened in the past, we ensured to include also those interviewees who were present in the company since early 90s. Five of our interviewees have been employed at the company at least since the beginning of the first period of events. In addition, four of the interviewees have been employed at the company at least since the middle of the first period of events (late 90s or early 2000s).

The interviews were face-to-face, audio recorded, and lasted between 30 and 60 min. The presence of a researcher may influence the behavior and response of the subjects. This threat is an inherent limitation of the research method used, but was alleviated somewhat by the guarantee of confidentiality of the data and cross checking the results with participants in the study.

The construct validity could have also been improved by investigating the quality of the UX and usability artifacts or even developed products over the years. We investigated the UX artifacts generated from 1992 to 2015 however our aim was mainly triangulation of the interview data rather than analyzing the quality of these artifacts. We believed judging the quality of the artifacts or the UX delivered through the products required a more controlled setting and longer investigation of these artifacts or products. This was therefore not feasible, in particular, since a number of these artifacts were generated before the start of our research study or that we did not have access to the previous versions of the products. More importantly, it is not possible to evaluate UX delivered through these products out of their context and time e.g. a product that is perceived as 'novel' in the 90s, may be perceived as 'old' in 2015.

In any empirical study, incorrect data is a threat to *internal validity*. Interviews were audio recorded to mitigate this threat. The authors also analyzed the material in several rounds of independent as well as joint sessions to gradually reach consensus on the intended meaning of the responses. We also cross-checked the results of our analysis with the interviewees to validate and confirm the findings. Using variety of methods (observations, document analysis and interviews) also helped alleviating this threat.

Another limitation is that in the period under study, the case company itself has evolved and naturally gone through changes outside the scope of our study. There are, therefore, other sources that may have also influenced UX integration but are not reflected in our data. However, we draw the reader's attention to this limitation and highlight this study does not provide cause and effect relationships of events and their enabling or prohibiting role in integration. Rather, the study aims to provide a holistic picture of UX integration and the company's transition to the extent supported by our data.

External validity concerns the ability to generalize the results beyond the actual study. In case studies, the intention is to enable analytical generalization where the results are extended to cases which have common characteristics and hence for which the findings are relevant. The case company is a medium-sized Swedish software development company, developing a business-to-business product. We therefore expect our findings to be valid for companies with similar characteristics. In addition, we have compared and contrasted our findings to the existing theories on organizational change which further contributes to external validity of our research. Another concern is that our data gathering was performed in 2014–2015. We finalized our research collaboration with the company in 2015 and at that time the efforts to improve UX integration were still ongoing, and a satisfactory level of UX integration was not yet achieved as our data shows. However, as we have not gathered more data on the organization since 2015, our data may not reflect today's UX state-of-practice in the studied organization. However, the data is valid when interpreted in its own time frame. In particular, since the aim of this study was to understand the transition the company has gone through over the years. In addition, to minimize the effect of the time frame on our analysis, we have included recent studies published since 2014 when discussing the results.

Another threat concerns *reliability*, the extent to which the data and analysis are dependent on the specific researchers. Although the coding process is performed by the first author, to improve reliability of the generated themes, the three authors individually and independently conducted a pilot coding of these segments. The outcomes of the pilot coding were discussed in several sessions with all three authors, and the differences in coding were analyzed and resolved. Also, we had carefully designed the workshops and interviews before running them. We also defined the coding process after the interviews and before analyzing the data. The initial codes were therefore identified mainly based on observed interview responses. We also ensured the themes are not imposed on the data rather emerged from it.

6. Conclusion

Through an investigation of the organization's transition from GUI design and development to addressing usability and more recently UX, we provided a more holistic and realistic picture of UX integration. We identified various events with different natures (internal or external, direct or indirect, emergent or planned) that impacted the transition to UX integration. Outside the borders of organizations, technological, theoretical and educational advances in the fields of HCI and SE contribute to an increase in knowledge and awareness of both internal and external stakeholders, changes in their expectations, attitudes, and priorities. These advances also may facilitate UX integration as they lead to organizations' easier access to required UX competencies and tools and methods. Internal events span across organizational units, are in a constant interplay with each other and the context of the organizations, and inevitably influence UX integration over time. Our findings extend current literature on UX (and usability) integration that often focuses on planned and internal events. We highlight the organizational change nature of UX integration and emphasize that software community can benefit from already existing organizational change guidelines and best practices to facilitate a sustainable UX integration in software companies. Most importantly, we show practitioners need to explicitly address differences between usability and UX in their change initiatives in order to ensure moving beyond usability integration to UX integration. Although our findings, including the lessons learned and pitfalls, are specific to UX, they can also shed light on integrating less mature and new knowledge areas such as software quality characteristics into software companies.

Acknowledgments

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