The Merits of Situated Evaluation as an Alternative UX Evaluation Method to Understand Appropriation

Peter Börjesson[1,2], Wolmet Barendregt[1], Eva Eriksson[2,3], Olof Torgersson [1,2], Liza Arvidsson[2], Linda Persson[2]

[1] University of Gothenburg, Sweden
[2] Chalmers University of Technology, Gothenburg, Sweden
[3] Aarhus University, Aarhus, Denmark
{peter.borjesson, olof.torgersson}@cse.gu.se

Abstract. Oftentimes, technologies are not used in the ways designers had initially envisioned. Instead, people adapt technologies to their own needs, a phenomenon called 'appropriation'. Appropriation is an important aspect of User Experience design, related to the situatedness and dynamics of the design, recognizing not only that initial needs and requirements may change over time, but also that a design may change the environment that it was designed for. Appropriation can also contribute to a sense of ownership as people use a design in their own way, sometimes in ways the designer did not intend. However, commonly used User Experience evaluation methods often do not focus on the appropriation process of a technology. Situated Evaluation is an approach that does focus on appropriation, although it has not yet been used extensively in the UX field. In this paper, we therefore present and critically discuss our use of the Situated Evaluation approach for the evaluation of a specific tool that aims to enhance the communication between children, parents, and teaching staff in special education. By presenting this case, we hope to inform other UX researchers and designer about the potential of the approach to understand appropriation is an important factor in UX design.

Keywords: User experience; appropriation; evaluation; situated evaluation; pecial education; communication

1   Introduction

Harrison et al. [1] argue that when designing technological artifacts, the study of the local, situated practices of the users should be the focal point, since meaning is created in the context and situation, often in collaboration between the people, the artifact and the environment as well as the resources available where the artifact is used. Because of the situated nature of use, many technologies are not used in the ways designers had originally envisioned. However, according to Dix [2] 'these improvisations and adaptations around technology are not a sign of failure, things the designer forgot, but rather show that the technology has been domesticated, that the users understand and are comfortable enough with the technology to use it in their own ways' (p. 27). This phenomenon is called appropriation. In addition to the situatedness of the technology, Dix also points to two additional advantages of

appropriation: dynamics and ownership. Over time, environments and the people in them change, and most likely so does their use of technology. A design for use must therefore be a design for change [2]. Appropriation can also create a feeling of ownership, as the users feel that they are in control or find new ways to achieve their goals. These feelings of ownership can be as important to the User Experience as the things that are being achieved with the technology [2].

Fully understanding the appropriation of an artifact can be quite complex, and we need evaluation methods that take into account both the context and practices of the environment where it is introduced to understand how these in turn affect the use of the artifact. Additionally, evaluation methods must consider social and organizational consequences from the introduction of the artifact, i.e. how it will change the context and practices of the environment. Lastly, based on the above, evaluation methods need to help us understand how users shape their use of technology over time. These aspects can often be hard to capture with traditional user testing, e.g. Thoresen [3], reports that user testing with prototypes typically deals with normal use and does not consider unusual or unexpected ways to use technology. She concludes that the quality of a technological prototype should be evaluated from the role it plays in the practice of use. This is especially true for multi-user systems [4] where it is difficult to capture the user experience with traditional evaluation methods e.g. user testing.

Bruce et al. [5] have proposed an approach called Situated Evaluation, which is an alternative to traditional formative or summative evaluations, focusing on how innovation emerges through use, and how the social practices and the context of use affect how the technology is appropriated. The results of a Situated Evaluation could lead to developers changing the technology, to users changing their practices, to adoption of only parts of the technology, or to deeper understanding of the process of use. Thus, the core of the approach is to consider diverse uses, the setting of these uses and the underlying cause for the diverse realizations. Rather than seeing users as passive recipients of technology, Situated Evaluation recognizes users as active creators, as appropriators.

However, Situated Evaluation as an approach to understand appropriation has not found its way into the User Experience evaluation field. In this paper we aim to present and exemplify this approach by describing our experiences with using the Situated Evaluation approach to understand the use and appropriation of a communication tool for special education, called TellMe. We start by describing appropriation and the Situated Evaluation approach. We then give a brief introduction of TellMe and the context in which it is envisioned to be used. Thereafter we describe how we have applied Situated Evaluation in our case. While we need to give examples of the types of findings we obtained by applying this method, the focus is not on these findings themselves, nor on the effectiveness of the communication tool. Rather, we hope to provide insights into the use of Situated Evaluation and the types of findings that can be expected instead of merely relying on more standard formative and/or summative evaluations. We also aim to provide some advice for others considering the use of Situated Evaluation.

2   Background

According to Roto et al. [6], user experience captures the connection between the user, their daily life practices and some technology in different time spans of usage: anticipated experience (before usage), momentary experience (during usage), episodic experience (after usage) and cumulative experience (over time). As users interact with technology over a longer period of time, they may actually go from a first encounter, through episodes of usage, to reflection of usage [6]. Such a journey may result in use

of the technology that designers never anticipated; the users appropriate it. As pointed out by Dix [2], such user adaptations are not failures, but something that shows that users are comfortable with the technology and understand it well enough to change it to fit their needs. Appropriation may occur when there are no existing ways to accomplish a task, or when appropriation makes a task easier, either at the moment or because of anticipated learning time [2]. In this paper, we thus focus on a method to enable the understanding of appropriation as an important part of the user experience. In the following sections, we will discuss some of the literature on what appropriation is, and present Situated Evaluation as a promising method to specifically understand appropriation.

2.1 The model of Technology Appropriation

The Model of Technology Appropriation [7, 8] shown in Fig. 1, was developed to show the appropriation process from *Technology as Designed* to *Technology in Use*. In this process, users evaluate the technology at three different levels.
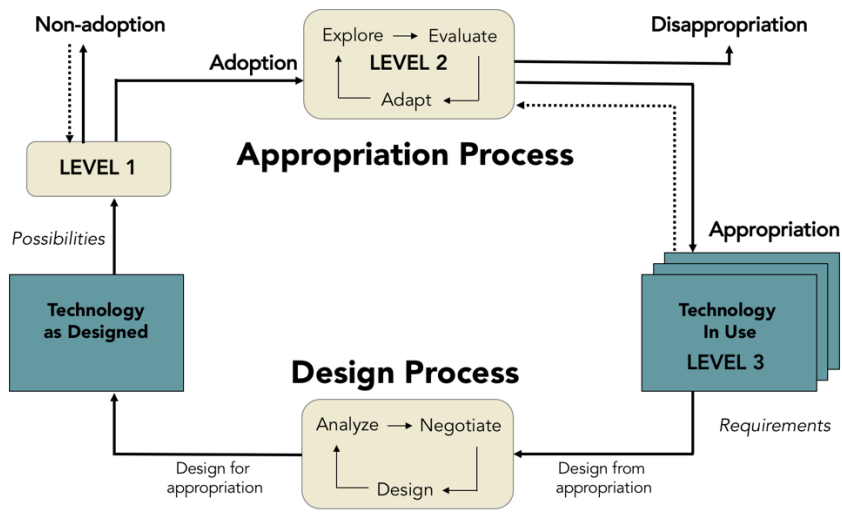

Fig. 1. The Model of Technology Appropriation. Adapted from [6].

At the first level they consider the technology as originally designed, based on its features and their own expectations of its value. Based on this, users choose to either adopt the technology or not. At the second level, users continuously explore and evaluate the technology as they use it and learn how it can support their practices. As technology may enable or constrain certain activities, users change their activities to fit with the technology. In addition, depending on the malleability of the technology, users try to adapt it to fit with current needs, or for completely new purposes. During this stage, there are a number of influences that encourage or discourage continued appropriation. If users do not reject the technology during this stage, the third level will be reached over time. At this level, the technology has become an integral part of

the users' practice, and no further adaptations take place. However, this may change if the users' evaluation of the technology changes, in which case they return to the previous level where the technology may once again be rejected.

Based on the above, the model shows a clear difference between the requirements of *Technology as Designed* and *Technology in Use*. The first represents the expected requirements captured during the design process, whereas the latter represents needs formed in the use of technology in everyday practices [7]. This suggests that even a very thorough user-centered design approach and requirements analysis may struggle to find all requirements of the technology in use. In fact, Carroll [7], argues that user appropriation could be seen as the completion of the technology design process, and that it could also inform further design iterations. Similarly, Tchounikine [9], argues that to intentionally provide users with means that enable them to adapt the system to their usage rather enriches the requirements gathering efforts by considering how users may develop new usages. Designing for appropriation is about finding means for supporting different types of use, in contrast to defining or controlling one correct usage. The requirements analysis needs to include individual and collective needs, but also different and shifting artefact ecologies, social norms, and contexts (e.g. [4, 10, 11]).

2.2 Situated Evaluation

Situated evaluation, developed by Bruce et al. [5], is an approach that aims to capture the appropriation process. While described in the context of the evaluation of an educational technology it is applicable to other kinds of systems as well. The aim is to understand how innovations emerge through use by considering diverse uses and different contexts as underlying reasons for the diverse appropriations. Although Situated Evaluation is a process of discovering relationships, and can therefore not be proceduralized, three key elements can be discerned: the *idealization* of the technology, the *settings* in which it appears and the *realization* within each setting.

- The *idealization* serves as an indication for the intentions of the developers as they often are important participants throughout the creation of the technology. Further, this element is used to identify how the technology is perceived or anticipated by the participants of the study.

- The *setting* forms an important part in how a technology emerges and considers aspects about the social context of use, i.e. cultural, institutional, and pedagogical aspects. This includes the goals and expectations of the participants, the institutional practice, constraints, and resources.

- The *realization* of the technology in each distinct context aims to study how the innovation is used, how the use changes and the reason for these changes. Accordingly, an important part is to study the use in multiple contexts to identify the differences in how the technology is realized or recreated by the users. Lastly, this element involves examining how to change the design with consideration of the findings regarding the actual use of the technology.

A Situated evaluation emphasizes the uniqueness of each situation in which the technological artifact is used [5]. This shifts the focus of the evaluation from the artifact itself and its idealized form, to also consider the different realizations and unique situation in which it is used. Following this, a Situated Evaluation aims to answer new kinds of questions focused on *Technology in Use*, compared to traditional evaluations that may be more focused on *Technology as Designed* (see Table 1).

Table 1: Questions about technology and use. Adapted from [5].

Traditional questions in evaluations focused on Technology as Designed	New questions asked in a Situated Evaluation focused on Technology in Use
What can the technology do?	What do people **do** as they use the technology?
To what extent are the technology's goals achieved?	How do **social practices change**, in whatever direction?
What constitutes proper, or successful, use of technology?	What are the various **forms of use** of the technology-in-use?
How should people or the context of use change in order to use the technology most effectively?	How should the technology be **changed** and how can people interact differently with it in order to achieve their goals?
How does the technology change the people using it?	How does the community **fit** the technology into its ongoing history?

2.3 Our case

In the following two subsections we will discuss in what setting and for what technology we have used the Situated Evaluation approach. Thereafter, we will continue with a presentation of our application of this approach in more detail.

2.3.1 The Special Education Context

Special education in Sweden is its own school form, with its own curriculum, separate from the ordinary school [12]. Special education schools can be separately located or integrated in an ordinary school, and children in a special education school can attend classes together with children in an ordinary school or in classes with children in special education exclusively. The school activities in special education schools should as much as possible correspond to ordinary school education [12].

The children in the Sweden's special education are diagnosed with an intellectual disability, often co-occurring with conditions such as Autism Spectrum Conditions, Downs Syndrome, Cerebral Palsy, or Attention-deficit/hyperactivity disorder, but are not grouped or divided based on those diagnoses. This makes it a very heterogeneous population struggling with social, emotional, cognitive, behavioral, perceptual, motoric or motivational conditions and impairments. Also, a lack of ability in attention, scheduling tasks and motivation tends to be common among the population, as well as deficits in the working memory that may influence the ability to report on and make generalized statements over time [13]. An important part of special education is that children are given individually adapted support based on their needs and abilities. This support can be provided by teachers, student assistants, helping the child during the school day, as well as personal assistants [13].

2.3.2 The TellMe application

The purpose of TellMe is to support communication between the home and the school context, not just between educational staff and parents, but especially also between

parents and children. According to Harris [13], family conversation plays a key role in children's emotional development. However, many parents of children in special education feel that family conversations are hampered by a lack of insight in their children's experiences during the school day. TellMe aims to support this communication by providing two applications: a diary and a contact book (see Fig. 2).
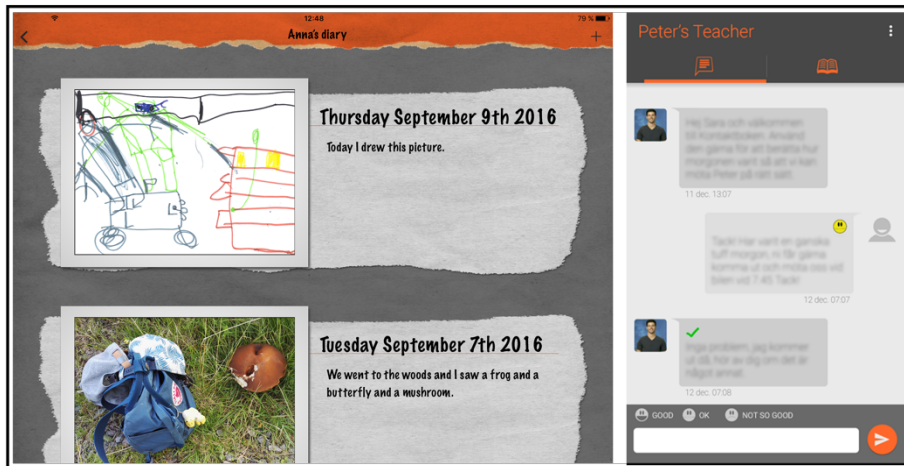

Fig. 2. The TellMe applications: Diary (left) and Contact Book (right)

The diary is a tablet-based application that the children use in school, on their own or with help from an adult to create diary entries about their day, composed of text and a picture. Both parents and teachers can read the diary updates in the contact book application. The contact also book supports direct contact through text messages between the parents and the teacher and is installed on their smart-phones. Besides text messages the application also provides a set of symbols that allow parents to quickly communicate the emotional state of their child to teachers before they arrive at school. For teachers, the symbols are used to unobtrusively and quickly reply to a message by e.g. indicating that the message has been received. At home, parents can use the diary updates as a way to talk with their children about their day in school. This may help children to develop their social-emotional skills.

Examples of applications that have similar functionality as the TellMe diary include Niki Diary [14], Story Creator [15], Mental Note [16], and MyCalendar [17]. However, TellMe particularly supports the communication between the school, the parents, and the child, thus providing a direct link between the parents and teachers as well as an immediate insight in the children's education through the contact book. In the remainder of this paper we will describe the results of our Situated Evaluation of TellMe and discuss the advantages and challenges when using this approach. We will simply say 'contact book' and 'diary' to refer to the two different parts of TellMe.

3 Using Situated Evaluation to understand appropriation

TellMe was developed in several iterations by involving the children, parents and teachers in a special education school in different co-design activities. A first prototype of TellMe was developed and formatively evaluated in the same school for half a year. The results of this evaluation led to a re-iteration of the application design. However, we were aware that the tool would probably be used differently in other special education schools. Therefore, we aimed to evaluate the appropriation of TellMe to grasp, not only what should be improved, but also how the tool could be opened up for different appropriations.

3.1 The Idealization of TellMe

The first step in a Situated Evaluation is to describe the idealization. In our case, the idealization was based on how the parents, teachers and children in the school that had participated in the design intended to use TellMe (see Table 2).

Table 2: The idealization of the TellMe Diary and Contact book.

Idealization of the Diary *(Technology as designed)*	Idealization of the Contact book *(Technology as designed)*
D1. Installation. The diary will be installed on a shared tablet where children will use their personal account to create diary entries with help of the teacher(s).	**CB1. Installation**. The contact book will be installed on each teacher's, assistant's, and parent's personal smart-phone. This will connect teachers and assistants to the individual parents and children in the class.
D2. School use. During the day, children with help from their teachers take pictures and write short messages in the diary.	**CB2. Parents contact school.** Parents can reach the teacher(s) of their child through the contact book. This can be done at any time but it is foreseen as something that parents usually do in the morning to inform the teacher(s) about their child's mood, food problems, and health-related problems.
D3. Look at diary. Parents can see the diary entries at home (through the contact book) and use them as a way to talk with their children about their experiences in school that day. This will help children to develop their social-emotional skills.	**CB3. Teachers contact parents.** Teachers can reach the parent(s) of a child through the contact book. This can be done at any time but it is foreseen as something that teachers usually do at the end of the day to inform the parent(s) about particular events that occurred during the daily activities.
	CB4. Quick status messages. Parents can use symbols to communicate the emotional state of their child to the teachers and assistants. Teachers can use symbols to quickly acknowledge receiving a message from a parent.

3.2 Recruiting schools

To understand the impact of the context on appropriation it is important to include settings with different cultural, institutional, and pedagogical aspects, including goals and expectations of the participants, the institutional practice, constraints, and resources. The project's aim was thus to include different special education schools in our evaluation. The school that had participated in the previous design and formative evaluation of the application was considered an important stakeholder, although, as Bruce [5] noted "similarity to the idealization does not count as more successful, and non-use can be as important to consider as 'faithful' use" (p. 688). This school was located in one of the highest income areas of the City and the children were between 11 and 16 years old. We will call this school Alpha.

Unfortunately, recruiting other schools turned out to be rather difficult, making a conscious selection of different school settings impossible. In total 19 special education schools were invited to participate in the evaluation; only three of them agreed. One of these schools showed great initial interest in using the application and participating in the study. However, after a first meeting with the teachers, where the application and the study were presented, the school decided to withdraw from participation. This *non-adoption* of the technology [7] was due to the application not fitting with the school's existing practices and being perceived as too time consuming to use. In the first version of TellMe presented at the school, we had idealized that many schools may not have personal tablet for each child, so the application was designed so that all diaries for a class would be accessible from any tablet. However, in this school, all children had a personal tablet and as a consequence access to each other's diaries. The teacher would thus be required to both supervise the children as they made entries in the diary and also manage the login and logout procedure on each child's tablet before and after the sessions, to avoid misuse. For this class this was not a suitable solution due to the limited number of teachers to a higher number of children. Consequently, the application was redesigned with a setting to indicate whether the tablets should have access to all diaries in the class (when there was only one or a few tablets available), or access to one diary only (when children had personal tablets). Unfortunately, the changes to the application were not enough to convince the school to reconsider their participation.

In the end, two additional schools were recruited (which we will call Beta and Gamma respectively) with four classes in total (1 class from Beta, and 3 classes from Gamma). Fortunately, the three schools presented rather dissimilar settings, as was the purpose of our evaluation. Beta was a very small school based in a low socio-economical area with many immigrants from different cultures. Gamma was a larger school located in a middle-income area. From this school, three classes agreed to participate. An overview of the participating schools is given in Table 3. In all classes, teachers, children and their parents, were invited to participate. The teachers sent consent forms to the parents and those who signed the form were then involved in the study. Written consent from the parents in combination with verbal consent from the children were required before any child was involved in the study. Not all children in all schools participated since either the parents did not hand in their consent, or in some cases the children were absent from school for all interview and observation occasions.

Table 3: Overview of the participants for each class.

School	Alpha	Beta	Gamma		
Class			A	B	C
Age of children	11-16	5-8	10-13	10-12	12-14
Number of teachers	2	1	1	1	1
Number of assistants	6	3	3	4	1
Number of children	12	4	4	5	3
Children participating	8	4	3	5	3
Parents participating	9	5	6	4	5

3.3 Data Collection

The purpose of a Situated Evaluation is to understand differences across contexts related to the questions asked in approach presented above. This demands a relatively long-term and ongoing engagement of the evaluators. However, for practical reasons (end of the school year getting near), our Situated Evaluation could only last for four to six weeks. The methods used to understand those differences are not prescribed but "imply the use of qualitative tools, including observations and interviews that are structured to elicit information about recurring social practices in the setting and to draw out differences among realizations" [5 p.689]. This meant we had to find appropriate qualitative methods for data collection in this particular context. We chose to perform semi-structured interviews as well as observations, and we also logged data from the application: the diary entries and contact book messages.

Interviews with both teaching staff and children were performed at three occasions: before the introduction of TellMe, after 2-3 weeks, and after 4-6 weeks. The parents received the same questions by mail at those three occasions. The choice to ask the parents for written answers instead of doing interviews was made because it would be hard to arrange an interview several times during the relatively short evaluation period. If parents preferred to be interviewed over phone, this option was also provided, and used by three of the parents. The questions asked were based on the questions asked in a Situated Evaluation as described before, focusing on understanding appropriation and *Technology in use*. The questions asked before the introduction of TellMe focused on the setting and current practices, e.g. aimed to understand current ways of communication, for example by means of using a booklet to communicate. The questions asked during and after the use of TellMe focused on understanding different realizations of the technology in use.

Observations were conducted in the classroom, both before and after the introduction of TellMe. In the later stages the observations focused on the use of TellMe. The application also logged data on the communication between the parents and teachers as well as the diary entries by the children. This data was both quantitative, such as number of entries in the diary, and qualitative, e.g. the actual content in the diary, including text and photographs, as well as the written conversations between the parents and teachers. This data helped us to understand whether TellMe was actually used, and in what way.

3.4 Data Analysis

The data, consisting of observations with field notes, interviews and logfiles, was analyzed using thematic analysis [18], and by triangulation [20] of informants' statements about their use as well as our observations logfiles. The analysis was conducted in several different iterations, where the data gathered in each phase was first anonymized and analyzed separately, then together with the findings of the subsequent phase. First, the data was organized according to each school and each iteration. The recorded interviews were transcribed, and the notes from the field and the observations were structured and re-written. Then, the data was coded according to the goal of the current analysis. The initial rough coding consisted of predetermined codes derived from the five general questions that can be asked during a Situated Evaluation: (1) What do people **do** as they use the technology, (2) How so **social practices change**, in whatever direction, (3) What are the various **forms of use** of the technology-in-use, (4) How should the **technology be changed**, and (5) How does the community **fit the technology** in its ongoing history? Within these broader categories, we identified finer-grained codes for the remaining analysis.

4   Results of the Situated Evaluation

We start the presentation of the results with a comparison of the idealization of the diary and the contact book with a short description of the realizations in each context and the needs for further functionality arising during the evaluation. Thereafter, the results for each school are presented in more detail, starting with a description of the school context in which TellMe was introduced, followed by the realizations of both applications in this context in comparison to the idealizations as presented previously.

Table 4: Summary of the results for the TellMe Diary.

Idealization of the Diary	Realizations and arizing needs for functionality of the Diary		
	Alpha	**Beta**	**Gamma**
Installation. The diary will be installed on a shared tablet where children will use their personal account to create diary entries with help of the teacher(s).	The diary was installed on the children's individual tablets instead of shared tablets. Most of the children in this school were able to create diary entries by themselves, while some children required help from the teachers.	The diary was installed on the children's individual tablets instead of shared tablets. None of the children used the application independently, but two of the children were very actively involved, and the teacher indicated that independent use could be possible.	Since the children in this school (all classes) did not have any tablets, several tablets were borrowed from the university, but there were not enough for each child to have a personal tablet. Instead, tablets were shared between children, as idealized.

School use. During the day, children with help from their teachers take pictures and write short messages in the diary.	The diary was mainly used by the children and teachers at the end of the day if there was a final activity in the classroom. Both parents and children expressed disappointment that the diary was not used more often. Many children in this school were able to use the TellMe diary independently, but therefore one of the children pointed out that there should be an option to delete an entry if something went wrong.	The diary was used at least once a day to document what had happened during the day, especially in the form of pictures. This was similar to how the class used to work with the binder before the introduction of TellMe, but was perceived quicker and smoother.	Class A used the TellMe diary once a day, just like they had used a analogue diary before. However, since not all of the children took part in the study, the teacher was required to use the analogue diary and TellMe in parallel. When creating diary entries, different levels of support were provided by the teacher or assistants. Class B initially used the diary throughout the day, where children created entries together with the teachers. This was perceived easier than using the analogue diary once a day because it allowed posting immediately. Towards the end of the evaluation, diary entries were only created occasionally because teachers thought it was too time consuming. Sometimes, the teachers created diary entries with only a picture without the children, so that parents would have something to talk about with their child at home. In class C the ratio between children and adults affected the use of the diary. When there was insufficient time, an adult would take pictures and write text, but when there was enough time they involved the children actively. While the latter was more time consuming it was also described as more fun and inclusive. If the children could use the application more independently the teachers reasoned it would probably be used more frequently.

Look at diary. Parents can see the diary entries at home (through the contact book) and use them as a way to talk with their children about their experiences in school that day. This will help children to develop their social-emotional skills.	Two of the children expressed that they wanted to be able to use the diary at home, to view it with their parents. This indicates that some parents did not look at the diary entries together with their child. However, some parents still expressed positive changes in both the communication with the school and the children through the use of the diary and hoped it would be used more. A few parents suggested that they would like to be able to acknowledge that they had seen the entry within the application, and that this should be visible within the child's diary. However, the teacher pointed out that this could demotivate those children whose parents did not acknowledge the diary entries.	Only for one child the application was used to support the child's communication with the parents, enabling the child to reflect on school when at home.	While entries in the booklet mainly consisted of text, and were only sometimes complemented with pictures, the focus in the TellMe diary for all classes became on choosing or taking a picture and writing a complementary text. In this school TellMe thus changed the practice related to creating diary entries. One parent reported that this improved the communication with their child at home as the pictures were a better support in the conversations, making it easier for the child to retell events from their school day.

Table 11: Summary of the results for the TellMe Contact book.

Idealization of the Contact book	Realizations and and arizing needs for functionality of the Contact book		
	Alpha	**Beta**	**Gamma**
Installation: The contact book will be installed on each teacher's, assistant's, and parent's personal smart-phone. This will connect teachers and assistants to the individual parents and children in the class.	Although the contact book was installed on the teacher's personal smartphone, none of the assistants had the application installed. The reason for this was that the teacher had an initial idea that TellMe should be installed on a shared phone used by the assistants but this was never realized.	Three of the children had their own personal assistant. On the teacher's request, TellMe was therefore configured to connect each child to the teacher and the child's assistant and parent(s). Assistants therefore only received messages for one child, while the teacher received messages for all children. This configuration was not foreseen in the idealization of TellMe but could be accomplished.	Due to the no-mobile phone policy in this school (all classes) the contact book was installed on the teacher's tablets. Since the assistants did not have tablets, the contact book was installed on the children's tablets as well. Consequently, both the diary and the contact book were installed on all of the children's tablets. Although the parents

			were willing to use the contact book, the school felt that this configuration of TellMe was too insecure since teachers and assistants had a great responsibility to remember to sign out from the application, compared to if it would have been installed on their personal smartphones, as was foreseen in the idealization.
Parents contact school: Parents can reach the teacher(s) of their child through the contact book. This can be done at any time but it is foreseen as something that parents usually do in the morning to inform the teacher(s) about their child's mood, food problems, and health-related problems.	The contact book was used frequently to write short and fast questions, times for picking up and leaving children, questions about lost things and similar. The teachers reported that with the introduction of TellMe the number of phone calls from parents had decreased and the communication within the application was less intrusive. Teachers were now able to discern how urgent different matters were, and deal with them accordingly, without disturbing class activities. Parents felt that the contact book offered faster and clearer communication for simple matters.	The contact book was hardly used in Beta. Only one pair of parents used the contact book to communicate with the school and used it mostly for informal messages and greetings. Two of the remaining parents only wrote an initial message in the contact book, and the last pair of parents never used the application. Since none of the parents replied to our questions the reason remained unclear. A possible reason mentioned by an assistant was the language barrier. This assistant actually wanted to write in the contact book in the parents' native language but chose to write in [the language] to make sure that we could analyze the data properly, something that may have hindered adoption. Another possible reason mentioned was the intense daily contact the teachers had with the parents, making the communication in the application somewhat superfluous.	In class A, the use of the contact book replaced much of the previous email conversations between the school and the parents. As the use of booklet was a well-established practice and used frequently in class B before the introduction of TellMe, the class continued to use this throughout the study, in parallel with TellMe. Some parents were also less active in the use of TellMe, making it insufficient in providing information to and from the parents. A few parents fully adopted TellMe in their communication with the teacher and reported that the communication had increased. Although much of the old way of communicating between the school and parents was maintained, the application changed the communication as it provided more direct and faster responses compared to the booklet. In class C, some parents decided to completely replace the booklet by TellMe as it allowed for more

			private information to be exchanged between parents and school. However, one parent pointed out that more complex matters should still be done by phone or email.
Teachers contact parents: Teachers can reach the parent(s) of a child through the contact book. This can be done at any time but it is foreseen as something that teachers usually do at the end of the day to inform the parent(s) about particular events that occurred during the daily activities.	Before the introduction of TellMe the teachers had pointed out that there was a discrepancy between what parents and teachers considered to be urgent matters. With the use of the TellMe contact book, one parent explained that the application should only be used for simple matters, and that the teachers should still use phone or email to communicate about more complex matters. This indicates that some form of agreement between school and home about what kind of information belongs where is needed.	The teacher explained that although she was optimistic about the contact book, the limited time of use was not worth the effort to persuade parents to use the application. Interestingly, she also pointed out that the parents with whom the communication was already good, were the ones with whom the communication in the TellMe application also worked well.	The teacher in class A provided the parents with an update of the daily mood of their child through the contact book and used it to send various reminders to the parents. In class B, the teacher explained that prior to TellMe she used a reception notice for email to ensure that the parents had received the information. Although TellMe did not provide this functionality, parents responded to messages more frequently, confirming to her that the information had been read. The teacher in class C still sent the weekly newsletter by email, due to the limited possibilities to write longer messages and of sending the same information to multiple receivers in TellMe. One parent said that the communication between the teacher and parent had not changed that much with the introduction of TellMe. However, it did allow for more direct communication compared to messages written in a booklet.
Quick status messages: Parents can use symbols to communicate the emotional state of their child to the teachers and	The option was never used by the parents. By using fast replies within the application, the teachers felt they could reassure the parents that the message had been	This option was never used by the parents or teachers	This option was never used by the parents or teachers

assistants. Teachers can use symbols to quickly acknowledge receiving a message from a parent.	received and that they would get back to them as soon as possible.		

4.1 School Alpha

The children in Alpha were mostly verbal and able to write. Not all children in the class participated in the study. All children had their personal tablets, but these were only used in school and the children were not allowed to bring them home. Teachers were allowed to use their personal smartphones. Before the introduction of TellMe, all parents usually tried to communicate with their children about their school day. However, they explained that the answers from the children were often short and felt that with more information about their child's school day, they would to be able to guide their child better in this conversation.

The school did not use a specific digital contact tool but had participated in the formative evaluation of a previous version of TellMe. The school used email for daily information, and a weekly printed newsletter as well as written notes for those parents that did not use email. Phone calls were only used for more serious or urgent matters. However, the teachers pointed out that the parents and teachers sometimes differed in what they saw as a serious or urgent matter, and they also felt that it was problematic to receive phone calls during lessons since it had a disturbing effect. Information was also shared between parents and teaching staff when the parents came to bring or pick-up their child, but many had transportation service to and from school.

In summary, we can say that school Alpha used TellMe almost as idealized. However, the diary was only used occasionally towards the end of the day, making it a less frequent activity than was hoped for. Furthermore, the possibility for parents to use icons to quickly communicate their child's emotional state was never used, even though it had been designed on the basis of this school's input. Two appropriations (or unanticipated advantages) were discovered through the situated evaluation. First of all, one parent contacted the teacher through the contact book when her child struggled to explain something that had happened during the day. By being able to quickly ask the teacher about it through the contact book and get an explanation, she was able to guide her child in retelling the event. The contact book was thus used as an alternative or complement to the diary. Second, the distinction between the diary for the children and the contact book for the parents and teachers in TellMe was a relief to one of the parents: "The analogue contact book was always something that increased my child's anxiety, because it could contain information about how the child had behaved in school. With respect to this, digital communication, that the child is not aware of it in the same way, works much better."

The school chose to continue using TellMe after the evaluation, which indicates that it has become a Technology in Use.

4.2 School Beta

The children in Beta were much younger than in the other two schools and some of them were not verbal. All children and at least one of their parents participated in the study, but several of the parents were not able to speak [the language]. The children

all had individual tablets, and they were allowed to bring their tablets home after the school day. The teachers used their personal smartphones during the school day.

Before TellMe, the teachers and children used printed pictures glued into a binder to document and inform parents about the school day. During the first interview, the teacher expressed hope that TellMe would increase the parents' involvement in the children's education. The parents and teachers used email, text messages, and phone calls to communicate with each other. Information was also shared as parents brought or picked up their child, although the teachers felt that it was sometimes problematic to find the time and opportunity to go through all information at this time since the children were often present or the parents were in a hurry. Furthermore, some of the parents in this class were unable to speak Swedish, and one assistant told us that there was limited communication with one of the parents due to language difficulties.

School Beta used the diary as it was idealized, as the application fit well into existing practices. However, for two of the children the reason for using the diary was more related to improving the connection between the home and the school by providing parents with an insight into their children's education. As the children were allowed to bring their tablets home, one family appropriated the technology by also making diary entries at home. On the other hand, the contact book was rarely used. Interviews with the teachers and assistant suggested that language barriers, as well as the daily meetings when children are dropped off or picked up were possible reasons for the non-adoption of the contact book. Interestingly, the fact that the school took part in an evaluation may have hindered appropriation in two ways. First, one of the assistant chose to write to the parents of a child in Swedish rather than in the parents' native language, and second, the teacher explained that the limited time of the study did not make it worth the effort to persuade parents to start using the application. Even if the contact book was not used, this led to an interesting appropriation of the diary that was used to show pictures when the parents picked up their children. This supported the communication between some of the assistants and parents and bridged the language barriers. Beta stopped using TellMe after the evaluation.

4.3 School Gamma

Several children from the three classes at Gamma were not verbal. All children participated, except in one class, where one child did not participate. In this school, the children did not have any tablets. The teachers did have tablets to use for work, but assistants did not have any. In addition, the school had a no-mobile phone policy, prohibiting teachers from using their own phones during work hours.

Before the introduction of TellMe, all classes used a booklet in which the teacher and child could write and glue printed pictures. One of the teachers explained that while this may be perceived as a bit out of date, it had a personal touch, which was appreciated. The booklet was not only used as a diary but also used to share information between the school and parents, functioning more like the contact book of TellMe. It was used at the end of the day to document what the child had done in school and to share other information with parents. This information was usually written by the teacher and then read by the assistants to keep them up to date with the information flow. One of the teachers experienced problems with the booklet being forgotten somewhere being brought back and forth to school. Several of the parents said that they used the booklet to communicate with their child about their school day, as their child struggled with retelling events from the day on their own.

The school used a weekly newsletter to inform parents about upcoming activities. Important information was communicated through email as the booklet could be read by anyone. However, using email was sometimes problematic as it had happened that

parents had changed jobs with a new email address but forgot to communicate this to the teacher. One of the teachers thus said that most of the important information was communicated with the parents directly when they left or picked up their child.

Summarizing the findings for School Gamma, the diary application was initially used as idealized, especially in one class. However, in the other classes it was deemed too time consuming to assist the children in creating diary entries. This led to TellMe being used less frequently, or assistants creating diary entries directly without involving the children. As in school Beta, a parent wanted to use TellMe to create diary entries at home. This was not possible as children in this school were not allowed to bring the tablets home, so this parent asked for this functionality to be added to the contact book. While the contact book was used, most of the established ways of communication were maintained in parallel by the teacher. The parents that did use TellMe reported that the communication between home and school had improved, but neither parents nor teachers used the possibility to communicate with the help of symbols. In one class, the application also improved the communication among teaching staff as they now had access to the same information at any time. However, most teachers and assistants felt that their particular configuration of TellMe, due to the no-mobile phone policy, was too insecure. This school continued to use TellMe for a few months after the evaluation, but then stopped using it.

5 Discussion and Conclusion

In this paper we described our use of the Situated Evaluation approach to understand appropriation as an important component of the user experience. As stated by Dix [2], appropriations should not be considered as failures in the design but are on the contrary an important part of the user experience. It has also been argued that the design process is not complete until designers can understand how users appropriate technology [7, 8]. The purpose of doing a Situated Evaluation is to "learn first how the innovation is used, not how it ought to be changed or whether it has claimed effects" [5].

By mapping the schools using TellMe in our Situated Evaluation to the Technology Appropriation Model [7], we were able to distinguish different levels of appropriation for the diary and contact book. One school (the school that was involved in the earlier design phases) used the diary and the contact book mostly *as Designed*. Another school appropriated the diary to *Technology in Use* in a few different ways, while choosing *Non-adoption* of the contact book for several reasons. Finally, one school initially appropriated both components to *Technology in Us*e but faded gradually to *Disappropriation*. Also noteworthy is that an additional school that chose not to participate in the study because the technology was perceived as unfitting with their existing practices, could be mapped as non-adopters of TellMe.

The Situated Evaluation not only showed different forms of appropriation but also revealed several factors in the context causing these different forms of appropriation, such as routines for bringing and picking up children, the presence or absence of similar technologies in the school, policies for mobile phones in school, and policies for taking technologies home.

While it could be argued that a more extensive user-centered design approach and requirements analysis involving more schools could have caught more requirements, it has also been pointed out that understanding appropriation can enrich the requirements gathering as designers can learn about new usages of the technology [9]. Similarly, simply involving more schools in the design process without a focus on appropriation would likely only have caught more requirements for *Technology as Designed*, and not for *Technology in Use* [7]. Even for the school that had been

involved in the design of TellMe, in which we had also performed formative evaluations on an earlier version of the application, the Situated Evaluation indeed led to many new insights concerning its use. We thus argue that the Situated Evaluation approach is a very useful approach to understand such appropriations, which is an important factor in understanding the User Experience going beyond initial use. However, doing Situated Evaluation is not an easy feat. Some points to consider are the following:

- **When can I do a Situated Evaluation?** Based on our experiences, a Situated Evaluation requires that the technology is developed far enough to allow for its adoption and appropriation. This means that the technology can be used without much interference and guidance of the developers.

- **Should you include contexts that have been involved in earlier phases of the design in your Situated Evaluation?** It might seem reasonable to expect that contexts involved in the design of the technology will use it as idealized and might be less interesting to include in a Situated Evaluation. However, in our study where we chose to include this context, we noticed that even small changes such as teachers switching jobs, could result in different use. We thus think that including this context in the evaluation might be very useful for understanding the intricacies of use.

- **Does a Situated Evaluation show actual use?** Even though a Situated Evaluation comes closer to a real use scenario, many of our participants were still aware of the fact that it was an evaluation, which would end at some time. One teacher told us for example that this was the reason that she put less effort into persuading the parents to start using TellMe than she usually would when starting to use a new technology. At the same school an assistant wrote messages in Swedish instead of the native language of the parents in order for us researchers to be able to understand. This will always remain a problem when doing any kind of evaluation but can be particularly important to keep in mind when the aim is to understand appropriation. As shown, the evaluation itself can make it problematic to understand what full appropriation of the technology in use [7] would look like.

- **What is the ideal time frame for doing a Situated Evaluation?** In order to really grasp the innovations of use of any technology, a situated evaluation should probably last longer than the four to six weeks we used in our evaluation. However, a complication is that even after this short time, some schools had started to rely on our system. Giving people access to a system for a longer time during an evaluation can create a situation where researchers have to continue supporting the system because it has become a technology in use, even when research funding has stopped.

- **Is it appropriate to define the questions to the participants beforehand?** While it is good practice to think of the questions for the participants before the actual evaluation, we felt that it would have been more beneficial to adapt some questions based on our observations. In our case, we should have changed the questions to the parents to capture some important details about their routines for picking up and leaving the children. Although we thought that parents would inform us about this through our questions. Unfortunately their answers were often not rich enough to really understand this. By explicitly asking about such routines we could have gained a clearer picture, although we are aware that asking too many highly detailed questions could also overburden them, resulting in even more missing responses.

- **What is the best way to get responses from the participants about appropriation?** Since a Situated Evaluation is usually performed over a longer period of time, asking the participants to provide feedback several times, it can be a struggle to get numerous and detailed responses. In order to make it as easy as possible for the parents to share their thoughts with us, we decided to provide them with different ways to communicate with us. However, while reaching parents through email made it possible to collect more answers, they often lacked the richness of the telephone interview data. While an alternative could be to invite participants to several group discussion, it is unsure whether they will be willing to make the time for this. In the end, a Situated Evaluation may often mainly help to understand appropriation by those participants that are most engaged, while lacking the views of those that are less engaged.

- **Is there any advice on doing a Situated Evaluation with children in special education in particular?**
  Any evaluation to understand the user experience by involving children in special education may suffer from communication difficulties. Since our Situated Evaluation involved three interview situations with the children, we observed that it was easier to talk to the children when there was a concrete physical object to talk around. By using a mediating tool (the children's analogue contact book in the first phase and the diary application in the two latter phases) it was easier to get more elaborate answers and maintain greater focus from the children. This was especially apparent at School Gamma were the interviewer initially did not use the application as a mediating tool, but had to interrupt the interview and get the child's tablet in several cases. Once the application was available, the children knew exactly what it was, and were able to talk about it. Further, by using a mediating tool it was easier to redirect the child's attention back to the interview when they drifted off. However, providing the children with a tablet also occasionally caused them to lose focus as they wanted to talk about and show other things on it rather than the application.

- **Is there any advice about logging data?** While we logged the information that was sent between the different users in order to understand the frequency and content of use, we did not log passive use, such as only reading a diary entry or a contact book message. We would definitely recommend others to consider logging this kind of information since it can provide a more complete view of the ways people choose to use the technology.

Since the purpose of a Situated Evaluation is not to determine a technology's effectiveness, we have not focused on whether communication between parents, teachers and children really improved. The various examples of the findings from the evaluation of TellMe were not presented in this paper in order to provide guidance for further development of TellMe or for others interested in developing similar applications but rather in order to inspire and help others who are in the need of selecting an appropriate method for a doing an evaluation not merely based on more standard summative or formative methods. However, after making several changes to TellMe it would be appropriate to perform a summative evaluation to answer the question whether TellMe is a tool that supports communication between parents, children and teachers, and eventually leads to improvement of children's social-emotional skills. The different appropriations discovered by using this evaluation approach could also lead to design from appropriation [6], something we have to consider doing, especially given the current interest of many schools in the region to start using TellMe with their pupils.

In this paper, we have exemplified the use of the Situated Evaluation approach to understand appropriation. Although we have used this approach to study

appropriation of a specific tool for special education, TellMe, We hope that this detailed example of the use of the Situated Evaluation approach to evaluate TellMe may provide some insights and inspiration for other User Experience designers, researchers, and developers when planning, carrying out, and studying situated user experiences, practices and contextual appropriation of technology.

References

1. Harrison, S., D. Tatar, and P. Sengers. *The three paradigms of HCI*. in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '07)*. 2007. ACM Press.
2. Dix, A., *Designing for appropriation*, in *Proceedings of the 21st British HCI Group Annual Conference on People and Computers: HCI... but not as we know it*. 2007, BCS Learning & Development Ltd. p. 27-30.
3. Thoresen, K., *Prototyping organizational changes*, in *Participatory Design Conference*. 1990. p. 22-35.
4. Bødker, S., Klokmose, C.N., *Dynamics in artifact ecologies*, in *Proceedings of the 7th Nordic Conference on Human-Computer Interaction: Making Sense Through Design*. 2012, ACM: Copenhagen, Demark. p. 448-457.
5. Bruce, B.C., A. Rubin, and J. An, *Situated Evaluation of Socio-Technical Systems*, in *Handbook of Research on Socio-Technical Design and Social Networking Systems*, B. Whitworth and A.d. Moor, Editors. 2009, Information Science Reference: Hershey, PA. p. 685-698.
6. Roto, V., et al., *User experience white paper - Bringing clarity to the concept of user experience*, in *Result from Dagstuhl Seminar on Demarcating User Experience, September 15 - 18, 2010*. 2011.
7. Carroll, J., *Completing Design in Use: Closing the Appropriation Cycle*, in *ACIS*. 2004. p. 337-347.
8. Fidock, J., Carroll, J., *The model of technology appropriation: A lens for understanding systems integration in a Defence context*, in *ACIS 2006*. 2006. p. 88.
9. Tchounikine, P., *Designing for Appropriation: A Theoretical Account*. Human–Computer Interaction, 2017. **32**: p. 155-195.
10. Jung, H., et al., *Toward a framework for ecologies of artifacts: how are digital artifacts interconnected within a personal life?*, in *NordiCHI*. 2008.
11. Kaptelinin V., B.L.J., *Interaction Design Beyond the Product: Creating Technology-Enhanced Activity Spaces*. Human–Computer Interact., 2012. **27**: p. 277–309.
12. Skolverket. *The school for learning disabilities is for your child*. 2014. Stockholm, Sweden.
13. Harris, P.L., *Understanding Emotion*, in *Handbook of Emotions*, M. Lewis, J.M. Haviland-Jones, and L. Barrett, Editors. 2008, Guildford Publications: New York. p. 320-331.
14. La Rocca, A., *Niki Diary*. 2015.
15. Innovative Mobile Apps Ltd, *Story Creator - Easy Story Book Maker for Kids*. 2013.
16. Zymbiotic Technologies, *Mental Note for tablet - the digital notepad*. 2016.

17. Haziq, M., L. Abdullah, and M. Brereton, *MyCalendar: Fostering Communication for Children with Autism Spectrum Disorder Through Photos and Videos*, in *OzCHI*. 2015.

18. Aronson, J., *A Pragmatic View of Thematic Analysis.* Qual. Rep., 1994. **2**.