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ABSTRACT

Despite User Experience (UX)' increased popularity, the willingness of organizations to integrate it into their processes and UX practitioners still encounter challenges in integrating UX methods. Research in HCI has presented theoretical and pragmatic models. Most of the time, these models lack presenting validation in practice, documentation or support for their use when difficulties appear. Even if difficulties could be expected. In this paper, we present a categorization of organizational barriers extracted from the relevant literature: lack of UX resources, lack of UX literacy, poor use of UX artifacts and communication breakdowns. Then, we propose a 4-step procedure to identify and overcome organizational barriers with a case study describing how this procedure helped us to anticipate and overcome organizational barriers encountered in a project. With a UX Capability/Maturity (UX CM) assessment conducted at the beginning of the project, we were expecting organizational barriers and constant readjustment of our UX strategy. We Communicated about findings and readjustment to stakeholders in order to increase their awareness about problems along the way of the project and we had prepared remediation strategies for the emergence of barriers.

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Overcoming Organizational Barriers to the Integration of UX Methods in Software Development: a Case Study

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Abstract. Despite User Experience (UX)' increased popularity, the willingness of organizations to integrate it into their processes and UX practitioners still encounter challenges in integrating UX methods. Research in HCI has presented theoretical and pragmatic models. Most of the time, these models lack presenting validation in practice, documentation or support for their use when difficulties appear. Even if difficulties could be expected. In this paper, we present a categorization of organizational barriers extracted from the relevant literature: lack of UX resources, lack of UX literacy, poor use of UX artifacts and communication breakdowns. Then, we propose a 4-step procedure to identify and overcome organizational barriers with a case study describing how this procedure helped us to anticipate and overcome organizational barriers encountered in a project. With a UX Capability/Maturity (UX CM) assessment conducted at the beginning of the project, we were expecting organizational barriers and constant readjustment of our UX strategy. We Communicated about findings and readjustment to stakeholders in order to increase their awareness about problems along the way of the project and we had prepared remediation strategies for the emergence of barriers.

Keywords: User Experience, UX Process, UX Barrier, UX Methods Integration, Software Development

1 Introduction

Over the last two decades, User Experience (UX) has become a core concept of Human-Computer Interaction (HCI), extending the perspective on usability to less pragmatic, more hedonic and non-task-oriented considerations about interactive systems [6-8]. This phenomenon has led to the proliferation of UX methods intended to support and improve both UX activities and software development [21]. However, the literature consistently reports the emergence of organizational barriers standing in the way of the integration of UX/usability into software development models [4, 5, 9, 13, 17, 18, 20, 22]. Table 1 synthesizes organizational barriers extracted from the relevant literature.

Table 1. Organizational barriers to UX

UX resources	Lack of time to perform UX activities	[13, 18, 20]
	Lack of UX budget	[17, 18, 22]
	Lack of trained UX staff	[4, 17]
UX literacy	UX mistaken for look and feel of products	[20]
	UX informally performed by developers	[4, 5, 13, 20]
	Lack of understanding of the return on investment (ROI) of UX	[9, 13, 17, 18, 20, 22]
UX artifacts	Focus on UX design at the expense of UX analysis and/or evaluation	[4, 5, 9, 20, 22]
	UX activities performed too late in the development lifecycle and important late design changes	[9, 17, 18, 20, 22]
Communication breakdowns	Limited access to users	[9, 18, 20, 22]
	Reluctance of user involvement	[9, 18, 22]
	Conflicts between management and managers	[18, 20, 22]
	Resistance to User-Centered Design	[17]

These organizational barriers prevent the implementation and achievement of UX activities. Worse, they reduce the benefits, or Return on Investment (ROI), usually associated with UX/usability: increased sales and revenues, increased user efficiency and satisfaction, reduction of development time and costs, etc. [3]. Nevertheless, barriers to UX appear to be insufficiently studied and discussed in the literature, which focuses almost exclusively on reactive solutions to these barriers rather than on means to anticipate their emergence and be adequately prepared to overcome them. This paper presents a case-based procedure and recommendations to identify and overcome barriers to the integration of UX in software development organizations. To this end, we propose the following 4-step procedure:

1. Conduct UX Capability/Maturity (CM) assessment to identify barriers to UX
2. Communicate findings to stakeholders to increase their awareness about potential problems along the way of the project
3. Prepare remediation strategies
4. At the emergence of a barrier: apply strategies.

The contribution of this paper is twofold:

- Clarification of the barrier concept through a targeted literature review;
- Documentation of case study that illustrates how to use the 4-step procedure presented above to identify barriers to UX and how we attempted to overcome them.

2 Background

Table 1 summarizes the organizational barriers to UX identified in the relevant literature. To identify the relevant literature, we conducted a targeted literature review using the following keywords: organizational barrier, usability barrier, UX barrier, development, barrier UX integration. Next, to classify the organizational barriers, we used a systematic mapping study of HCI practice research [16]. This, in turn, allowed us to distribute the organizational barriers among four categories:

1. Lack of UX resources
2. Lack of UX literacy
3. Poor use of UX artifacts
4. Communication breakdowns.

2.1 Lack of UX resources

This category refers to the cases where organizations cannot achieve the goals of UX processes because of a lack of UX resources. UX resources include time, allocation of a UX budget and trained staff. Lack of time occurs when teams are put under pressure to deliver work products. Typically, lack of time is characterized by design changes that happen too late in the development lifecycle [9, 20]. Related works document cases where UX/usability evaluation was integrated neither into the development process nor into the project schedule [13, 20].

Budget-related barriers occur in organizations that have not integrated UX in a sustainable manner yet: typically, such organizations focus on fixing UX flaws rather than on using UX as a strategic asset [18, 20]. Lack of budget and lack of time can be inter-related when a person, not necessarily someone knowledgeable in UX, is in charge of both UX budget and scheduling [22].

Barriers related to lack of staff occur when UX positions are not filled by trained staff with a background in UX, and when UX activities are informally performed by a another project team member, typically a developer [11, 13].

2.2 Lack of UX literacy

Lack of UX literacy refers to situations where the staff performing UX misunderstands or underestimates the value or the return-on-investment of UX [18]. In such situations, the preference is given to design at the expense of usability, to look-and-feel at the expense of the interaction, which tends to let developer, who are experts in coding, believe they can be substituted to UX experts [20]. Related work documents some case where UX experts are excluded from the decision-making processes and not acknowledged by stakeholders [9].

2.3 Poor use of UX artifacts/methods

If UX is misunderstood, UX methods may not be properly planned, properly executed and may not produce the expected outcome. If not properly planned, UX methods end up at the bottom of the list of prioritized items [22]. In a similar way, UX evaluations may not be performed in a robust manner and/or standardized [20]. Another issue is the tendency to want to obtain visible results quickly, at the expense of the robustness of user requirements analysis. By rushing into UX design without any prior knowledge

about user needs, expectations and limitations, software organizations increase the risk of late design changes, consequently significantly reducing the ROI of UX [4, 5].

2.4 Communication breakdowns

Communication breakdowns refers to interaction problems within an organization (e.g. group, department, company, etc.) or between several parties [9, 22]. For example, let us assume that UX expert E works for company A, which provides services to company B, within a Business to Business (B2B) prospect. B is the client of A, which is the client of E. From E's perspective, this corresponds to a B2B2C relation. In such relations, E needs to go through these two commercial relationships to get access to end-users. This distance from users causes a lack of knowledge about them. Limited access to the user (top-down) and lack of user feedbacks (bottom-up) are the most frequent organizational barriers to UX integration [11]. In this communication scheme, both users and E are located at the extremity of the communication flow, and internal problems could be found between them. Internal problems occur when top management or C-level executives' opinions have more impact on decisions regarding UX than those of UX staff [5, 22]. If top management or C-level executives do not have any commitment to UX, it can lead to resistance to User-Centered Design (UCD). Figure 1 depicts an example of such situation.

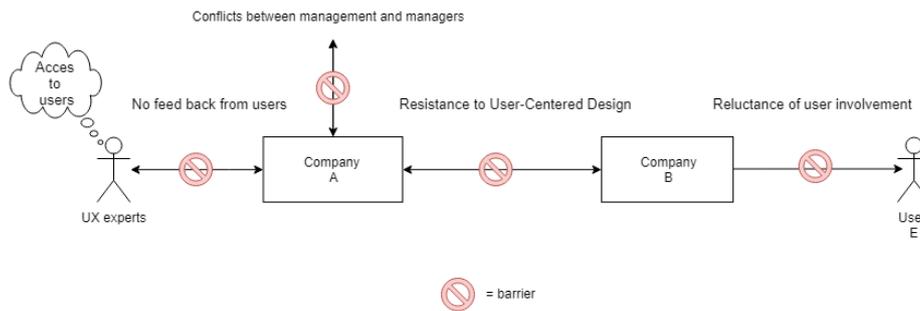


Fig. 1. Location of breakdowns in the communication flow

3 Proposed procedure

We propose a 4-step procedure to identify and overcome organizational barriers to UX:

1. Conduct UX Capability/Maturity (CM) assessment to identify barriers to UX;
2. Communicate findings to stakeholders in order to increase their awareness about potential problems along the way of the project;
3. Prepare remediation strategies;
4. At the emergence of a barrier: apply strategies.

The next section reports a case study that describes how we applied this procedure in a project with an industrial partner.

4 Case study

4.1 Context

This project is funded by Service Public de Wallonie (SPW) under convention n°7767 and intended to support the growth of a company—also referred to in the following as “our partner” or “organization”—whose core business is the sector of the energy. Specifically, the company develops software solutions for distribution system operators and energy suppliers in the gas and electricity market. Thanks to the SPW funding, the company intends to expand its market to neighboring countries and to increase its workforce and revenues by 2021. It is interesting to add that the company operates on a “home-shore” system: it does not have offices and its members work from home most of the time. Besides, it follows an agile approach for software development, which by its nature, implies frequent changes in project requirements.

The project was officially launched on February 26, 2018 in the presence of all partners: the organization, its subcontractors and the sponsor. The first author is the primary UCLouvain researcher on this project and was hired on September 15, 2018.

4.2 Mission and approach

Our primary mission in this project is to improve the UX of existing products. **Our secondary mission consists of supporting the integration of UX in the company’s software development model.** To fulfill our mission, we rely on earlier work on UX Process Reference Model [10] in the two following ways. On the one hand, we use the UX lifecycle proposed in this paper to communicate about primary UX lifecycle processes, especially to advocate for the integration of (user requirements) analysis activities as early as possible in the product development lifecycle. On the other hand, we use the classifications of UX methods and artifacts for roughly assessing the UX capabilities of our industrial partners.

It is worth mentioning that the mission takes place in a similar model than the B2B2C one depicted in Figure 1. In other words, we (the UX experts) need to go through these two commercial relationships in order to access users (Figure 2).

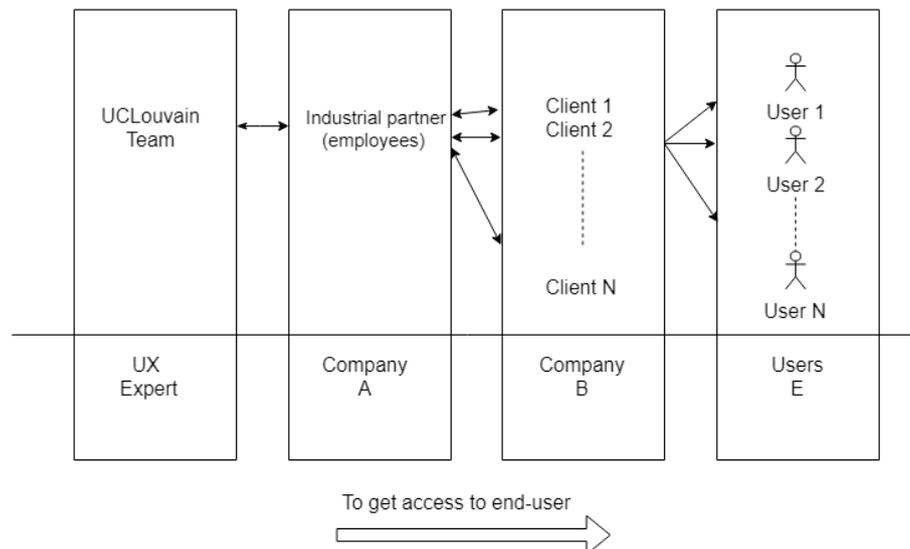


Fig. 2. Project organization model

4.3 Conduct UX capability assessment (step 1)

In March 2018, the third author carried out in-person, prospective interviews with two employees. The objectives were (1) to identify the business goals of our partner in order to turn them into UX goals; (2) to assess the UX CM of our partner in order to produce a subcontracting offer that would fit the partners' business/UX goals; and (3) to identify potential organizational barriers to the integration of UX in their software development model. Table 2 summarizes the results regarding UX resources, Table 3 the results regarding UX literacy, Table 4 regarding UX artifacts and methods and Table 5 regarding the communication breakdowns.

Table 2. UX resources

Barriers	Indicator
Time	Percentage of time spent on UX: <1%
	Enough time to conduct UX: no
Budget	Percentage of the UX budget within the IT budget: <1%
	Formal UX budget allocated to ongoing project: no
Staff	Designer-developer ratio: 1/100
	UX staff: no (UX informally performed by developers)

Table 3. UX Literacy

Barrier	Indicator
Understanding of the ROI of UX	UX does helps reduce development time and costs: no
Understanding of UX analysis	UX analysis is conducted before design and development: never
UX prioritization	UX activities performed too late in the development lifecycle: yes
	Summative UX is systematically employed before product release to make sure UX goals are met: never

Table 4. UX artifacts and methods

Artifacts	Preliminary interview
Persona	Never
Work models	Never
UX goals	Never
User story	Always
Task models	Never
Low-fi prototype	Never
High-fi prototype	Never
Design principles	Never
Methods	
Survey research	Never
Experience sampling	Rarely
Experiment	Never
Hierarchical task analysis	Never

Table 5. Communication breakdowns

Barrier	Indicator
Limited access to users	Users are involved as stakeholders throughout the product development lifecycle: never
Reluctance to user involvement	Survey research involving questionnaires is conducted to collect self-reported user satisfaction: never
Resistance to UCD	Contextual task analysis is conducted to elicit user requirements: never

4.4 Communicate findings (step 2)

The UX capability assessment allowed us to raise awareness about the following:

- Organization's UX goals/our mission: to improve the UX with their products;
- Barriers: difficult access to users; uncertainty about the sustainability of a UX budget; lack of time to implement UX; potential conflict of some UX methods with current software development model;
- Opportunities: public funding of this research, which will serve as a business case for UX in the organization; the significant size of projects under development in the company; important user needs for technical support and assistance; important user needs for a better UX with their products.

To communicate the previous findings to company's stakeholders and increase their awareness about potential problems along the way of the project, we had several meetings with our privileged contact person. He is a manager dedicated by the company to our project. He was also one of the two interviewees at the beginning of the project. During the meetings, we also presented our progress and needs for the current project. We set up a next meeting where he reported back to us on the organization's feedback and any new requests. Based on these new elements, we adapted our strategy.

4.5 Prepare remediation strategies (step 3)

We believed that making a business case for UX would help to overcome the barriers related to UX budget, time constraints, and conflict with the development model. Regarding the difficult access to users, we opted for the following strategy (step 3):

- A. Try to access to users in-person within a user-centered design approach,
- B. If strategy A failed, try to access to users remotely,
- C. If strategy B failed, use expert-based (without users) methods and techniques.

Our "Deluxe usability evaluation" (called "Strategy A") is trying to access to users in-person within a user-centered design approach. It regroups methods of contextual ethnography (contextual inquiry, work model, etc.), experiments with users (with calibrated instruments, A/B testing, etc.) and artifacts (affinity diagram and task model).

"Strategy B" represents the methods and artifacts producible without mobilizing users or going to the field.

Our "Strategy C" is using expert-based (without users) methods and artifacts. Nielsen's "Discount usability engineering" theory taught us that a good quality usability evaluation can be performed with few users, but with user nevertheless [1].

Discount Usability Engineering [11] is based on three components:

- Simplified user testing (think-aloud)
- Narrowed-down prototypes
- Heuristic Evaluation

The three components are based on both inspection and test methods. Inspection methods (heuristic evaluation) do not use end-users during the tests, whereas test methods use them. Better results are reached mixing these two kinds of methods [10, 12], but when the access to users is limited, inspection methods still remain the best option. We conducted a heuristic evaluation using UX guidelines in order to complete the spectrum of methods used and provide the organization with an artifact that can be used in the future.

4.6 Apply strategies (step 4)

Figure 3 describes how our objectives have changed over time: three different contexts of use (design of a dashboard, redesign of feature 1, redesign of feature 2) which corresponds to three different uncompleted iterations as highlighted by the red and orange symbols. The first line of each project specifies the context of use: users, tasks, platforms and environments [13]. As can be seen from Figure 3, the goal of Project 1 was to design a dashboard for clients. We first intended to gather client needs and expectations about this dashboard by means of context-meeting (strategy A). Context-meeting is a group discussion similar to a focus group with the emphasis on the context-of-use of the future product. Our industrial partner answered that it was impossible to gather representatives from different clients together at once. Therefore, we decided to conduct remote survey research using an online questionnaire (strategy B). We were told that the questions would not be understood by the clients as they were too technical, and that the survey approach would damage our partner's image. A few days later, we were assigned to Project 2.



The goal of Project 2 was to redesign feature 1: a front-end interface allowing users to consult gas and electricity consumption and invoicing. We first intended to conduct a controlled experiment with real users (strategy A). We were told that gathering the real users is too difficult because they are geographically spread out. Instead, we decided to conduct a heuristic evaluation (Strategy C). To do this, we asked to involve and train members of the company in this technique. We have prepared a short training for the two members who were assigned to this technique. Shortly after that, we performed the heuristic evaluation following Nielsen's usability heuristics [15], wrote the final report with prioritized issues and a redesign proposal. As far as we know, the report was distributed internally, but no further information was provided to us.

The goal of Project 3 was to redesign feature 2: a front-end interface similar to the previous one but for another client of our partner. We went directly to heuristic analysis (Strategy C) to evaluate the wireframes of this interface. However, unlike the previous analysis, no members of the organization were available, so the heuristic evaluation and the redesign proposal were done by the main author only. As for the project 1, a final report with prioritized issues and a redesign proposal were delivered, in addition to a set of pragmatic design guidelines. As far as we know, the report was distributed internally, but no further information was provided to us neither.

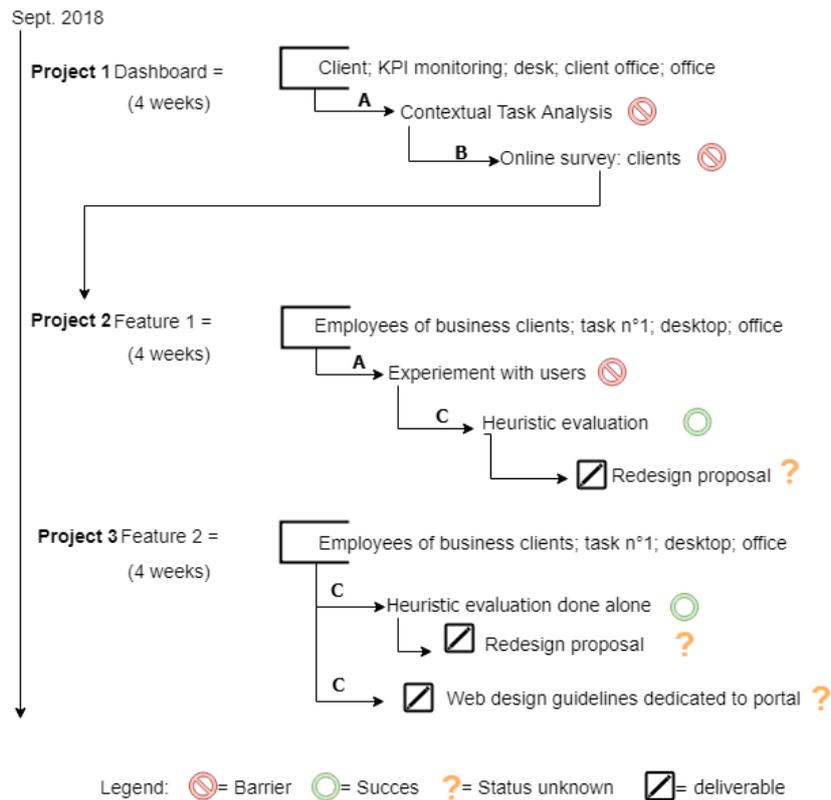


Fig. 3. Flow chart of our project

5 Next iteration

After had used the UXPRM for roughly assessing the UX capabilities, we had conducted a new iteration to draw an accurate picture of our partner UX practices. In view of the above difficulties, we have opted for an online questionnaire send by email. We have written the questionnaire and the introductory text. The email was sent to all employees, but only the subset of those aware of UX did so. This could be explained by the fact that the email has been rewritten before sending by the organization in this regard. As we do not know the exact number of people who received the email, we assess that the response rate is close to 14% (11 answers). The results of this questionnaire can be found in Table 6.

Table 6. Frequency of use of UX methods/artifacts (1: never; 2: rarely; 3: sometimes; 4: often; 5: always; ?: do not know how often; X: do not know this artifact)

Artifacts	1	2	3	4	5	?	X
Customer journey map	1	4	2	0	0	1	3
Persona	5	3	1	0	0	0	2
Service blueprint	0	2	2	3	1	0	3
Work models	0	3	3	3	1	0	1
UX goals	2	3	2	1	1	0	2
Affinity diagram	3	2	1	0	0	0	5
Concept map	2	1	2	1	0	0	5
Card sort	1	1	1	0	0	1	7
User scenario	0	2	5	1	1	1	2
User story	1	1	1	4	0	2	2
Task models	0	0	3	3	0	0	5
Low-fi prototype	1	6	2	0	0	0	2
High-fi prototype	2	2	2	1	0	1	3
Design principles	0	1	5	1	1	2	1
Methods	1	2	3	4	5	?	X
Group interview	0	2	6	1	0	1	1
Individual interview	1	2	4	2	0	1	1
Survey research	5	3	0	0	0	2	1
Experience sampling	5	1	1	0	0	0	4
Experiment	5	0	1	0	0	1	4
Instrument-based experiment	7	0	1	0	0	0	3
Observation	5	2	0	0	0	2	2
Simulation	3	1	2	0	0	1	4
GOMS	0	0	1	0	0	0	10
Hierarchical task analysis	0	1	2	1	0	0	7
Inspection	2	1	2	0	0	0	5
Literature review	0	2	3	0	0	3	3

Table 7. Frequency of use of UX methods/artifacts and preliminary interview (1: never; 2: rarely; 3: sometimes; 4: often; 5: always)

Artifacts	Interview	1	2	3	4	5
Persona	Never	5	3	1	0	0
Work models	Never	0	3	3	3	1
UX goals	Never	2	3	2	1	1
User story	Always	1	1	1	4	0
Task models	Never	0	0	3	3	0
Low-fi prototype	Never	1	6	2	0	0
High-fi prototype	Never	2	2	2	1	0
Design principles	Never	0	1	5	1	1
Methods	Interview	1	2	3	4	5
Survey research	Never	5	3	0	0	0
Experience sampling	Rarely	5	1	1	0	0
Experiment	Never	5	0	1	0	0
Hierarchical task analysis	Never	0	1	2	1	0

In Table 7, we compare the result of the frequency of use of UX methods/artifacts collected with the online questionnaire and the statements made in preliminary interviews. For example, in the preliminary interview, Persona was categorized as never realized and five people answered the same in the questionnaire, three answered “rarely” and one answered “often”. Table 8 compares the preliminary interview statements with the most frequent answer in the questionnaire. Only one artifact (persona) and two methods (survey research and experiment) present corresponding statements between the preliminary interview and the questionnaire, described as never used. This leads us to think that most of UX activities were not well understood and or not very perceivable within our partner.

Table 8. Preliminary interview and most frequent answer about frequency of use of UX methods/artifacts

Artifacts	Interview	Most frequent answer
Persona	Never	Never
Work models	Never	Rarely, sometimes, often
UX goals	Never	Rarely
User story	Always	Often
Task models	Never	Sometimes, often
Low-fi prototype	Never	Rarely
High-fi prototype	Never	Never, rarely sometimes
Design principles	Never	Sometimes
Methods		
Survey research	Never	Never
Experience sampling	Rarely	Never
Experiment	Never	Never
Hierarchical task analysis	Never	Sometimes

6 Discussion

With the aim of understanding organizational barriers and why they occur, we looked after dedicated literature. Few references cover the subject, even fewer attempt to present some explanations. However, one explication is presented by Lewis [11] with the

“peanut butter theory of usability”: *A spread that can be smeared over any software model, however dreadful, with good results if the spread is thick enough. If the underlying functionality is confusing, then spread a graphical user interface on it... If the user interface still has some problems, smear some manuals over it. If the manuals are still deficient, smear on some training which you force users to take* [19]. In other words, this would be due to a lack of understanding among companies of what UX is and confusion between UX and User Interface (UI). This misunderstanding leads to a poor use of UX methods and artifacts.

7 Conclusion

Typically, design and evaluation are intertwined within an iterative and incremental test-and-refine process that aims to improve the product. But organizational barriers can slow down or prevent iterative processes. To contribute to identifying and overcoming these organizational barriers, we proposed

- A categorization of organizational barriers
- and a case study to present a proposed procedure to overcome these barriers.

Thanks to the rough UX CM assessment conducted in the beginning of the project, we were expecting such constant readjustment of our UX strategy. We suggest that regularly interviewing employees of the company would allow to check for potential changes in the UX CM of the organization. However, mostly employed by the UX community [2], interviews lead to meaningful data but are time-consuming. This leads us to consider other tools for UX CM assessment in the future.

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