



UX Requirements to Public Systems for All: Formalisation or Innovation

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Abstract. Many countries are developing e-government applications for digitalisation of the interaction between citizens and government administrations. To be successful, such applications must be usable and provide good user experience for all. In Denmark, e-government applications have traditionally been developed through a contract-based approach; but the experience has been quite negative, in particular in terms of user experience and innovation. To increase the user experience and provide a broader range of innovative solutions, the Danish government and the organization of the municipalities have produced guidelines and material for a more user-centred development process for the ongoing digitalisation of local government services. We present the guidelines and material together with the findings from case studies in four IT companies, where we have interviewed employees and conducted redesign workshops. Our findings indicate that the material and guidelines are a step forward, but they are too general and have failed to ensure a reasonable level of usability and user experience.

1 Introduction

An increasing number of e-government applications are created to reduce or augment face-to-face contact between citizens and employees of municipalities. The success of such applications depend critically on usability and user experience. Empirical studies have found that if an e-government website has a high degree of usability, citizens are more likely to accept the website, and keep using it [11], [12].

Countries like the United States and the United Kingdom are considering the importance of usability when designing interfaces for e-government [14]. Nevertheless, Wangpipatwong et al. found that e-government websites in several countries lack usability due to poor design and non-employment of user-centred design methodologies [18]. In South Africa, guidelines for designing e-government websites do exist but are generally not being applied by the web designers of the South African Provincial Government [15], [16], [17]. It is essential that citizens view e-government websites as both credible and reliable and have a high level of usability and user experience. One approach to accomplish that is to involve the end-users. The goal in applying

user-centred design is that the system serves the user and that their needs influence the interface design [13].

The Danish municipalities are in the middle of a digitalisation process with the end-goal that by the end of 2015, 80% of the interaction between citizens and municipality employees, that was previously based on paper forms will be handled digitally [1]. An example of these is an application for a new driver's license. Denmark has a population of 5.6 mio. people and is divided into 98 municipalities which serve as the single point of contact for citizens in regards to the public sector [29]. The digitalisation effort in this domain is in line with the European Commission's initiative "Digital Agenda for Europe" that defines a set of actions for digitalisation of the European Union. Here, action number 64 is "Ensure the accessibility of public sector websites", and the aim is that the public sector websites for citizens should be fully accessible and usable for self-service by 2015 [2].

So far, development of e-government applications for Danish municipalities has generally employed a contract-based approach. With this, the development of a software system is based on a formal contract between a customer (usually a single municipality) and an IT company, where the contract includes a fixed specification of requirements to the application. The advantage of this approach is that there is little uncertainty about the application that will be delivered. However, there are numerous disadvantages, particularly for applications where the requirements are unclear or even changing over time. The contract-based approach typically involves posting of formal bid material (or call for tenders) that IT companies use for making their proposals. Then the bids are assessed, a single IT company is selected and a contract is signed. It has been argued that this approach implies that requirements that are not mentioned in the bid material and the contract are plainly ignored. The IT company that obtains the contract has no incentives to consider additional requirements that are not included in the contract; and often the contract has very limited focus on user interaction, usability and user experience because these aspects appear to be difficult to specify.

This has led some to argue in favour of formal user experience requirements that can be objectively verified. The motivation for this workshop states that "This problem of omission or poor formalization of UX requirements is limiting the success of projects in the public and private sectors."

It seems doubtful that a more formalised contract-based approach is viable, because in the e-government domain, the disadvantages of a contract-based approach are even greater than in the general case due to the nature of this domain [9]. Development of e-government applications involves a broad array

of different stakeholders, including citizens, public institutions such as municipalities, support organizations like an IT organization that is servicing a group of municipalities, IT companies that produce applications and third party purveyors that the public institutions use to provide services to the citizens. It has also been documented that user-centred design is particularly difficult to facilitate when a contract-based approach is employed for development of e-government applications. An important reason is that some of the stakeholders are difficult to involve in a contract-based approach [7, 8]. The most important of these is the group of prospective users.

Even if stronger formalisation may resolve some of the problems originating from limited focus on user experience, the lack of innovation will remain a key problem. When a contract is made between a single municipality and a single IT company, the individual municipality will not be able to choose between competing designs. Formalisation of requirements must be balanced against other factors, such as identifying user classes, introducing innovation, and ensuring consistency among products from the same IT company. For these reasons, the Danish government and the joint organisation of the municipalities in Denmark have decided on a different approach. A key aim is to make the design process more user-centred and to provide the municipalities with a range of e-government solutions developed by different IT companies [3].

This paper presents an empirical study of the user-centred approach that is being employed in the Danish digitalisation process. In the following section, we describe the material that has been developed to facilitate user-centred design in the development process and how the IT companies have been supported in their development of IT solutions. Then we present the method of our study of the IT companies. This is followed by a presentation of the findings of the study with focus on the way the guidelines and material was perceived by the IT companies. In the conclusion, we discuss our findings and experiences in relation to similar work.

2 Guidance Material and Supporting Activities

Denmark is in the process of digitalising a significant amount of the services that municipalities provide to citizen. The goal is that by the end of 2015, 80% of the forms that have previously been completed by citizens for the municipalities will be filled in and submitted digitally [1]. This strategy was set to be deployed in four waves. The first wave was deployed in December 2012 and the last wave in 2015. Each wave released a new set of digital applications. This study was conducted in 2013-14 focusing on the

development of applications for the second wave. The plans for these four waves are shown in Table 1 on the following page.

	Phase 1 December 2012	Phase 2 December 2013	Phase 3 Ultimo 2014	Phase 4 Ultimo 2015
Service areas	<ul style="list-style-type: none"> • Notification of address change • Application for day care • Application for registration in elementary school • Application for after school activities • Application for a health insurance card • Application for EU health insurance card • Book in nature • Payment for hunters' test • Application for admission • Payment of student loan 	<ul style="list-style-type: none"> • Notification of emigration • Application for protection of name and address • Application for loan to pay real estate tax • Application for free day care • Application for free after school activities • Change of general practitioner • Application for aid to burial expenses • Reporting of rats • Application for assisting technology • Application for subletting facilities or buildings • Application for marriage certificate • Application for passport • Application for a new drivers' license 	<ul style="list-style-type: none"> • Garbage handling for citizen • Garbage handling for organizations • Application for construction work • Application for building permission • Application for loan for deposit for dwelling • Application for citizen registration • Services in roads and traffic area • Notification of digging or work on pipelines • Certificates for lodging • Application for parking permits 	<ul style="list-style-type: none"> • Application for sole providers • Application for aid for maintenance • Application for personal supplement • Application for sickness benefit

Table 1. Phases of digitalisation of self-service areas in Danish municipalities [25].

Before the outset of the process, the government and the joint IT organisation of the municipalities in Denmark decided to employ a new approach. Instead of the traditional development process based on a contract with a fixed set of requirements, the municipalities' joint IT organisation developed guidance and the following material to support a user-centred approach:

- User Journey
- 24 Usability Criteria

The purpose of this material was to secure accessibility and keep a user-centred focus in the developed self-service applications. The joint IT organisation of the municipalities functioned in a supporting role during the development process. All interested IT companies could decide which specific services they wanted to develop. The services were produced and made available for all of the 98 municipalities in Denmark. The municipalities can buy individual solutions and are not bound by one self-service provider as they can choose freely between all developed applications in each area.

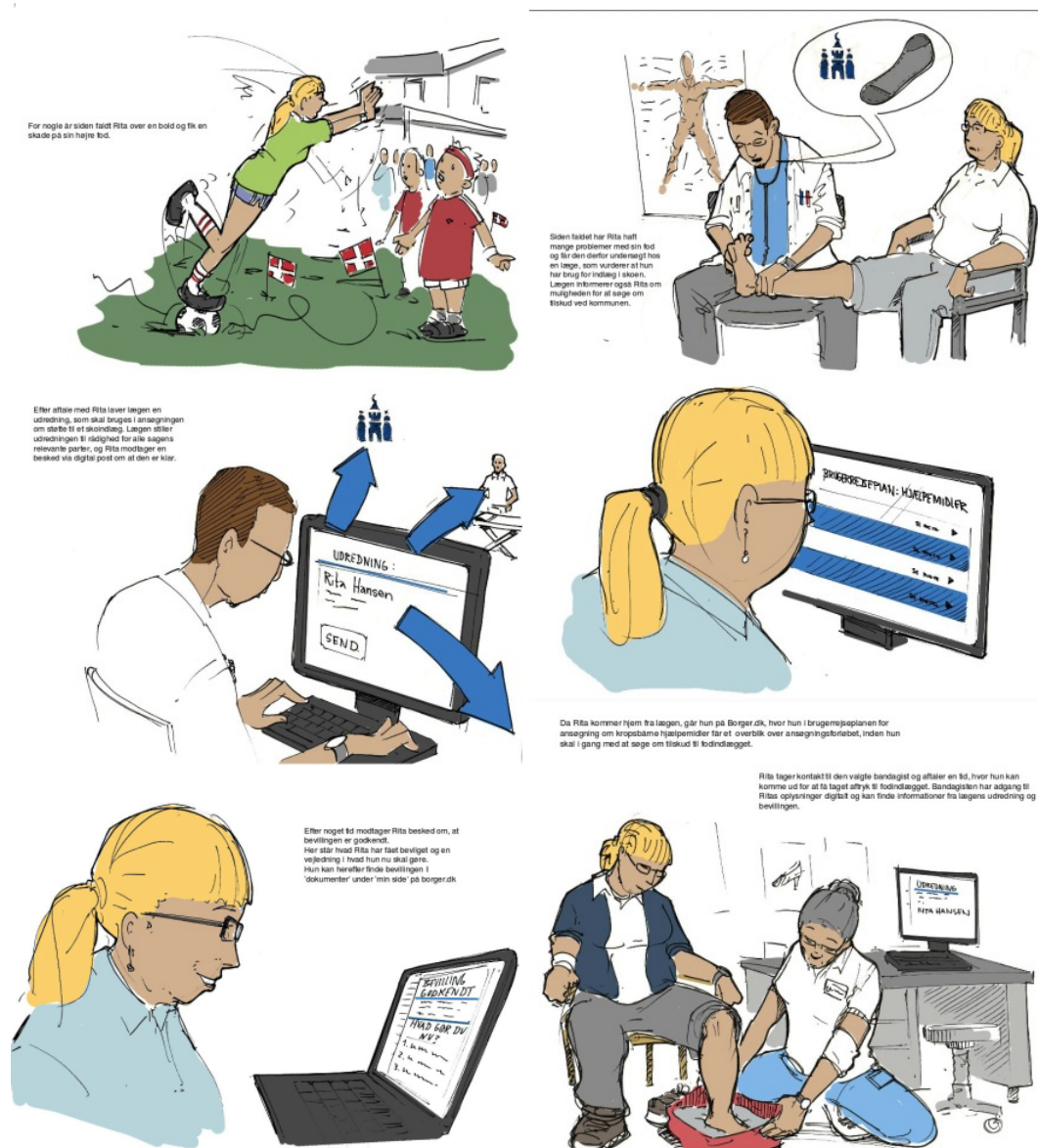


Figure 1. Selected drawings from the user journey for applying for assisting technology for handicapped or elderly [24]. The short texts are in Danish and describe how Rita got injured

some years ago. The doctor finds she needs an insole. Both interact with the system in order to apply for that. After approval, the insole is made.

2.1 User Journey

The user journeys can be described as a person in a use situation described in a scenario [23] using graphical illustrations. The user journey is a graphical illustrated story describing how a typical user will interact with the self-service solution. A user journey was created for each self-service solution in the second wave. The user journeys were made by the joint IT organization of the Danish municipalities. The user journey for a specific self-service was made well before the IT providers would start developing that solution. The user journeys were developed on the basis of meetings in a focus group including both citizens and case workers at the municipalities. This was done to ensure that the user journeys would reflect an actual real use situation and the users' needs. Once the content was defined, the drawings were made by a professional artist.

The purpose of the user journey was to give both municipalities and the IT self-service providers an understanding of when and how users could interact with each system, and to make sure that the end-users were kept in mind during the development process of the self-service solutions. A user journey was created for each of the specific self-service focus areas in the second wave. A total of ten different user journeys were developed. Six segments from a user journey can be seen in Figure 1 on the following page.

2.2 Usability Criteria

The usability criteria are a set of guidelines with the purpose of describing how the IT self service providers could ensure that their applications were usable for all citizens. The criteria were defined at a 2011 IT and Tele Administration workshop focusing on usability [26]. It is stated that the criteria were defined by experts. The criteria were divided into four main focus areas, each consisting of six sub-categories. All 24 usability criteria are shown in Table 2.

2.3 Supporting Activities

The joint IT organisation of the municipalities has taken several approaches to supporting the self-service providers. They have hosted meetings and workshops where all the self-service providers were invited, and they have had meetings on a regular basis with each self-service provider. Additionally, the

municipalities' joint IT organisation phoned the self-service providers on a regular basis asking for a status update and offering their help and services when needed.

	Language and text
1	Texts are short and precise without containing legalese or technical terms
2	Text should be action-oriented and help the citizen
3	The citizen is informed of which documents to attach before filling out the form
4	The citizen can access additional information if needed
5	If an error is made it should be made very clear what is wrong
6	Error messages should be in Danish
	Progress and flow
7	The form should be clear for the citizen
8	The extent of the form should be clear for the citizen
9	When filling out the form the citizen knows the progress made and how many steps are left
10	The receipt should be clear to see after finishing the form
11	The receipt should also be sent by email to the citizen
12	The next steps should be clear to the citizen after submitting
	Data and information
13	If login is required, NemLogin (National Danish Identity Service) should be used
14	Excising data should be reused as much as possible so a citizen should not give the same information more than once.
15	A summary is shown before sending the form
16	Sending a form should only be possible if all required information is present
17	The solution should validate the typed information as much as possible
18	The solution should adapt as much as possible during the flow
	Design and accessibility
19	It should be clear when filling out the form begins
20	There should be a clear distinction between positive and negative buttons, and the positioning should make sense
21	The authority behind the form should be clear
22	Navigating in the form can be done both using mouse and keyboard
23	The form can be filled out by the citizen without possessing special skills
24	The solution meet relevant accessibility criteria for self-service solutions

Table 2. The 24 Usability Criteria

3 Method

This study was conducted as an empirical case study. The data was collected in 2013-2014. To get an overview of the development of self-service applications for the second wave, we initially interviewed one Project Manager from each of the 11 IT companies identified as developing self-service solutions for this wave [30]. Thus the aim was to cover all 11 IT providers on an overall level.

Based on these initial interviews, we selected a self-service area and four IT-providers that we would focus on. As self-service area, we chose application for assistive technologies for handicapped and elderly; an example of this is application for a hearing aid. As IT-providers, we chose, from the total pool of the 11 IT providers, four companies that were developing a self-service solution for this service area. We interviewed a total of 14 people working in these four organisations. In addition to the interviews, we had one half-day meeting and one workshop with each of the four IT companies. The aim of these activities was to study the development process of the solutions for this self-service area in more into detail.

3.1 Participants

Four IT companies participated in this study. The application for assistive technologies for the handicapped or elderly was chosen because there were four self-service providers developing this solution which varied in maturity level. Two companies had an existing solution already in use by the municipalities that they were developing further, while the other two were new in this self-service area and were developing brand new solutions. The four organisations were divided as shown in Table 3.

	Immature organisation	Mature organisation
New self-service solution	Organisation A	Organisation B
Optimisation of existing self-service solution	Organisation C	Organisation D

Table 3. The IT companies chosen for this study.

The differentiation between mature and immature organisations was made in regards to developing self-service solutions. Of the new self-service providers, one was brand new in regards to self-service solutions. The other company was new in regards to the application for assistive technologies for

the handicapped or elderly but had developed several other self-service applications in Denmark.

3.2 Preparations

When starting this study we had one meeting with each of the four IT companies.

These meetings each lasted half a day. The project manager and the product owner were present, and in some of the IT companies a developer and a user experience designer were present as well.

At the meetings we were given a presentation of the development method used by the IT companies and how it was used in practice. We also received a demonstration of the self-service solution they were developing along with insights into how they worked with an on-site customer and their focus areas during the development process. At the end of the meeting we identified which people we wanted to interview as part of this study.

3.3 Procedure

To make certain all relevant people were interviewed for this study, we identified a set of relevant job functions that were perceived as important for the development process and which had extensive knowledge and different responsibilities in regard to the development process, knowing that some people might possess more than one of these job functions. The identified job functions were the following: Project Manager, User Experience Designer, User Interface Designer, Product Owner, Software Developer, and Market Segment Analyst.

We conducted between two and four interviews in each IT company, totalling to 14 interviews.

Three months after the first meeting we had a redesign workshop with each IT company. In that time period all interviews had been conducted and analysed. This meeting was conducted as a workshop in each company where the results from interviews were discussed and focus areas were identified. The entire preliminary conclusion from the interviews were discussed, processed, and modified in the workshops.

3.4 Data Collection

As part of this study four different methods were used for collecting data. We had one half-day meeting with each IT company. We conducted semi-structured qualitative interviews with two to four people involved in the

development process of the self-service solutions from each company, We completed a content analysis of relevant documents from both the municipalities' joint IT organisations and companies, and we hosted a re-design workshop with each of the four companies.

All interviews were conducted as semi-structured qualitative interviews as described by Kvale [4]. The interviews lasted between 25 and 59 minutes each.

The interviews established clarity in regards to the following:

- the interviewee's job function and level of experience
- the development process, including strengths and weaknesses
- the view of the user journey and usability criteria, including its strengths and weaknesses
- establishing whether the user journey and usability criteria were usable for the self-service providers
- missing elements in the existing materials and ways to improve this

After all interviews were conducted, the data was analysed in regard to the different perspectives of each interviewee and their job function in regard to the development process.

3.5 Data Analysis

Documents were gathered both from the municipalities' joint IT organisation and some of the IT companies. These were analysed and the results were used in correlation with the interviews. The interviews were transcribed and both interviews and documents were analysed using Dedoose (www.dedoose.com). All findings were added to a list that became the topics for the workshop discussions. All workshops were recorded. After the workshops were conducted, the recordings were transcribed.

The results from this study emerged in two steps. After the interviews were analysed, a list with our findings was created. This list contained all statements regarding the strengths and weaknesses described in relation to the user journey, usability criteria and self-service providers' communication with the joint IT organisation of the municipalities.

These identified weaknesses were discussed at four workshops, one with each participating IT company. These workshops led to a set of guidelines describing how to make the existing material more user-centred and which focus areas were currently not addressed in the existing material or supporting activities.

4 Findings

First we describe the findings from the conducted interviews, followed by suggestions for improving the user-centred approach.

4.1 Findings from the Interviews

Findings from the interviews are divided into three sub-sections describing perceived strengths and weaknesses of the user journeys, the usability criteria and the supporting activities. These findings identify the perceived strengths and weaknesses in regards to the development of the four self-service solutions and the companies' development process.

4.1.1 User-Centred Approach

The concept of involving User-Centred Design in the development process and creating user journeys was primarily described as a useful idea. The user journeys were generally described as neatly graphically created and helpful in regards to keeping focus on the end-user when designing the e-government applications. On the other hand none of the interviewees found the material to be a support in regards to developing self-service applications with a high degree of usability.

4.1.2 User Journeys

In regards to the user journey for application for assistive technologies for the handicapped or elderly, it was primarily used by the IT self-service providers in preliminary meetings with the municipalities as a tool for aligning expectations between the self-service providers and the municipalities.

“The user journey has been a strong tool for opening the dialogue with the municipalities.”

A few interviewees did describe some instances in which the user journey had set some expectations at the municipalities which the self-service providers then had to correct.

“Some municipalities thought we could deliver everything described in the user journey. They got quite disappointed when they realised we only deliver a small piece of the puzzle.”

The purpose of the user journeys was not communicated well, as some interviewees described that both they and the municipalities found it unclear whether the user journeys were to be perceived as a set of requirements or as a vision of how the citizens were expected to be interacting with the municipalities in a near or far future.

Most interviewees found the user journey useless in their analysis of the target user group for two reasons. The first is because the user journey only described one of many possible use situations and the second because the user journey was released too late in the process for them to use it in their preliminary analysis of the target user group and system requirements.

4.1.3 Usability Criteria

The 24 usability criteria are described as a mix of technical requirements and guidelines such as what kind of language to use in the self-service solutions. Several interviewees described how the interpretation of the criteria has been difficult at times, and several interviewees found themselves interpreting the criteria differently than intended by the municipalities' joint IT organisation. Several interviewees stated that this slowed their development process as this wrongful interpretation was not discovered until a later time, causing them to have to go back and restructure in order to meet these requirements. This was described as frustrating and several stated that they felt the usability criteria should have been described into more detail.

“I think they could have done a better job making the criteria understandable and user friendly for the self-service providers.”

Though this material was called usability criteria, the interviewees responsible for the usability and user-experience design of the developed self-service solutions felt that the usability criteria did not ensure that the self-service solutions would actually become usable for all citizens. The interviewees expressed opinions that the criteria lacked focus regarding actual use and usability.

4.1.4 Supporting Activities

Though most interviewees were positive in regard to the support they received from the municipalities' joint IT organisation, they also found room for improvement, especially in regards to release of time schedules and the supporting material. The interviewees also mentioned that the joint IT organisation should put more effort into making sure that supporting solutions, such as the power of attorney, which should be implemented into the new solutions, were released on time. Several stated that they had a very tight deadline to develop and implement the self-service solution, but they were delayed because they had to wait for others to finish the specific parts the self-service providers were required to implement into their systems. The self-service providers felt that the joint IT organisation of the municipalities should put more focus into making sure these portions were finished on time.

During this study we found several misunderstandings about the communication between the municipalities' joint IT organisation and the self-service providers. For example, all self-service providers thought that the usability criteria were mandatory to implement, leaving them struggling to understand and implement these criteria into their solution, but we found later that the usability criteria were only intended as guidelines. Several times we had one understanding from all self-service providers, but later learned that the joint IT organisation of the municipalities had a very different understanding. For the user journey, we found that some self-service providers thought it was meant as a set of requirements that the developed self-service application had to meet, but the intention from the joint IT organisation of the municipalities was that the user journeys were meant as inspiration to help keep focus on the end-user.

Several interviewees described having trouble finding the documents or supporting materials they needed from the joint IT organisation of the municipalities. Even though the needed materials should be readily accessible on a website, several interviewees described that they had difficulty finding what they needed on this website. The website was mainly described as confusing and the search function was not helpful in regards to this matter.

4.2 Suggestions for improvement

After the workshops we created a set of guidelines for strengthening the focus on user-centred design and enhancing the communication between the municipalities' joint IT organisation and the self-service providers. These guidelines were based on the discussions from the workshops. Each workshop processed the same topics, but the workshop with the second self-service provider was also based on the results from the first workshop, and so forth. It would have been preferable to host a single workshop including all four self-service providers, but as they are competitors and based in different parts of the country, it was not a feasible solution. Overall, four foci areas were identified that needed to be optimized: Clearer communication, widening the focus to include all parts of the system, and not just the front-end, strengthen the involvement of all stakeholders, creating more user-centred material, and implementing a user-centred focus. These five focus areas will be elaborated in the following section.

4.2.1 Clearer Communication

Lack of communication has been an issue. This has been less of an issue in the day-to-day communication, but more problematic in communicating the

purpose and intentions behind initiatives like the user journey and the usability criteria. The participants described feeling frustrated and confused from time to time. They also described employees at the municipalities feeling the same way.

It is important that the municipalities are part of the initiatives as they are the ones the joint IT organisation of the municipalities is representing. The case workers at the municipalities need to know the intentions behind the materials provided by the municipalities' joint IT organisation and how they will be able to use the materials to its full potential.

4.2.2 Widening the Focus

At the workshops it was made clear by the participants that the process lacked a sense of the system as a whole. It was described that the focus was primarily on the citizens' solutions at the front-end, but that this should go hand in hand with prioritizing the back-end as this will help optimize the flow of the whole process instead of creating two different systems that will de-optimize the work-flow.

As the focus is purely on the applications for the citizens, the system used by the case workers was not prioritized at all. Given that the aim was to save money in regards to the time that caseworkers use, this is a problem. Instead, the self-service solutions should be seen as one whole solution focusing on usability and efficiency in regards to both citizens and caseworkers.

4.2.3 Strengthen the Involvement of All Stakeholders

At the workshops it was described as very important to involve all stakeholders before developing materials supporting user-centred design. Stakeholders were divided into four different categories: citizens, municipalities, third party providers and IT providers.

Citizens should be represented within the target user group and involved in order to acquire an understanding of their needs and abilities. Some suggested involving societies such as those for the elderly or handicapped. Others were reluctant about this as they felt it was not ideal to involve societies that could set demands without having any responsibilities of their own.

Municipalities should be represented as their work-flows and procedures are very different. The case workers at the municipalities can also help with focusing on the correct group of end-users. The municipalities, as the purchasers of the IT solutions, need to be represented in the process as they are the ones who have to be able to use the materials to their full extent when buying the IT solutions.

Third party providers can be doctors, undertakers or surgical appliance makers. Some self-service forms are in all or most cases filled out by a third party provider. For example, the application for acquiring aid for a funeral is always filled out by the undertaker and not the relatives.

IT providers should be involved as they are the ones who will have to use the developed materials in practice. Involving them at an early stage will give them an opportunity to comment and point out deficiencies at an early stage.

4.2.4 Creating More User-Centred Material

At the workshops, three important areas were identified: vision, clarification of user needs and technical requirements.

These areas are already present in the existing materials, but they are mixed as the user journey consists of both visions and user needs, and the usability criteria consist of user needs and technical requirements. We suggested that existing materials could be redesigned into three separate pieces.

The vision would describe which requirements could be set in the future and which goals the municipalities' joint IT organisation wish to achieve with the self-service solutions. The vision should be revised as requirements for technology changes but should always keep focus on the interest of both the end-users and municipalities in regard to work-flow. By doing this, both municipalities and self-service providers would be able to understand what goals, existing solutions, updates and new solutions are important.

The clarification of user needs should describe several different types of users from the target user group and which special needs should be taken into consideration. This could be a collection of Personas as described by Nielsen [6] and focusing on special needs and requirements in relation to handicaps, nationality and age, depending on the target user group. This would give the self-service providers a thorough analysis of the end-users and their needs, and save the self-service providers time and effort. They all described not having time or funding for conducting a major user study themselves. If the joint IT organisation of the municipalities did this thoroughly, it would ensure all user segments would be taken into consideration during the development process of the self-service solutions.

The technical requirements should be created as a check-list targeted towards the software developers. This list should describe server response times and for which Internet browsers to optimise the software solutions. This would help the software developers to know exactly which technical requirements the self-service solutions had met, and it would provide the employees at the municipalities with a check list they could use when deciding which self-service solution to acquire for each self-service area.

4.2.5 Implementing a User-Centred Focus

The above suggested redesigns of the materials cannot stand alone in regard to acquiring a more user-centred approach both in regards to the citizens' usage and optimizing the work-flow of the caseworkers. This needs to be supported by conducting usability evaluations on all self-service solutions including the work environments of the caseworkers. These evaluations should be conducted by independent usability experts so all self-service solutions are tested on the same basis. Then all IT solutions could be rated and benchmarked, or in other ways quantified, to make it clear for the municipalities whether or not an IT solution is user-centred and usable. This would ensure the self-service providers are focusing on creating usable systems. This recommendation was also suggested by several interviewees and discussed at the workshops.

Both a formative and a summative evaluation should be conducted. The formative evaluation should be conducted early in the process and could be conducted using a paper prototype, which would make it fairly inexpensive to change the design and fix problems very early in the design process.

All self-service solutions should be user-tested at the end of the process by conducting a usability evaluation with citizens from different user segments, and then benchmarked as described above. This would mean that all self-service providers would have to keep a user-centred focus during the development process, and it would help the municipalities to acquire usable self-service solutions without major usability problems.

4 Discussion

Previous research shows that usability and user-centred design are crucial for designing e-government services [11-18]. Our study shows that implementing a user-centred approach is on the right track and the user-centred initiatives described in this study appear to be interesting and innovative. Nevertheless, the level of maturity is still low. In South Africa, guidelines for designing e-government websites have been created but are not being applied by the web designers of the South African Provincial Government [15-18]. In this study we found that wanting to implement user-centred design is not the same as actually creating a user-centred design. Creating and implementing tools such as a user-journey and usability criteria is a step in the right direction, but it takes time and more than one attempt to create materials like these that will actually improve the usability of the end-system.

Several researchers have argued that traditional methods for user-centred design are difficult or impossible to employ in the development of e-government applications. The arguments relate to the size of these projects [7] and the diversity of the user group [8].

A report from OECD on the European development of e-government services states very clearly that the focus on technology has for years overshadowed the need for organisational, structural, and cultural changes in the public sector. Therefore, key challenges and prerequisites for building attractive, integrated, user-focused e-government services have been left unaddressed [10].

This is in line with our findings where we have seen that some of the user groups have not been involved in the development of the IT services. Even though there has been a general interest in focusing on the users, citizens in particular, the actual involvement has been very limited. It is interesting that this is emphasized consistently by several of the IT companies who argue that the citizens should be more directly involved.

Some researchers have presented ideas for overcoming the challenges of involving citizens in the development of e-government systems. One idea is to include citizens directly in groups or through representatives [8]. Citizens were included by the joint IT organisation of the municipalities as various user groups were consulted when the user journeys and usability criteria were defined. However, our findings show that it has not been successful or sufficient.

Another possibility is to combine participatory methods with methods for technology assessment that have been tried in practice, although this requires a group that can drive these activities [7]. So far, that has not been implemented in the Danish digitalization project. It has also been suggested to use early prototypes as a means for verifying that the user requirements are correct [9]. However, the viability of this idea has yet to be demonstrated in practice.

Iivari and Iivari examine user-centredness as a multidimensional concept along four aspects: as user focus, as work-centredness, as user participation, and as system personalization [5]. User focus reflects the traditional approach in user-centred design. Work focus is concerned with the work activities of the users. User participation is the active and direct involvement of user. Finally, system personalization indicates that the designed system can adapt or be adapted to the user during use. The aim of the Danish digitalization project has been to achieve a strong user focus, although it has only been partly successful. The other three forms can be used as inspiration for further development. Unless there is a basic move in this direction, the intended degree of user take-up is unlikely to be realized [10].

Enhancing usability and designing with a user-centred focus is not only important in regards to the citizens. In Denmark the strategy of digitalising citizens' self-services was conducted with the purpose of saving money. Bruun and Stage found that redesigning a citizens' self-service application for applying for a building project like a garage could decrease the time spent by the caseworker from an average of 53 minutes to 18½ minutes [27]. This shows that a user-centred focus is not only for the sake of the citizens but is a key aspect in regards to saving money on implementing E-government self-service solutions.

Focusing on both the front-end for the citizens and back-end for the caseworkers is important in regards to saving money on e-government self-service solutions. This means that it should also be a priority to develop a usable system in regards to the caseworkers. Another study has shown that a new system at a hospital for patient charts was not found to be more usable for the staff even after they had actually been using the system for a year than it was immediately after the system was deployed [28]. This means that usability problems do not go away just because employees are using a system daily. Thus caseworkers in the municipalities are spending more time than necessary on each e-government application, compared to a system that was designed with a focus on usability from the start.

5 Conclusion

We have presented findings from an empirical study of the approach that is being employed in the Danish digitalization process as well as how it is viewed by the IT companies. We have focused on the materials that have been developed to facilitate user-centred design in the development process and how the IT companies have been supported in their development of e-government self-service solutions. Our findings show that supporting others in designing user-centred applications, while well-intended is not straightforward. Wanting to create materials to help others design user-centred materials need to be designed very thoroughly and there need to be an understanding of both the end-users and the IT companies that are meant to use the material. The designers of the user-centred material need to understand all aspects of the development process and the end-users' needs. This is a challenge and should not be taken lightly if designing user-centred material that others are supposed to use in regards to understanding and designing for a target user group. Key points are that the material designed to support the IT companies in designing user-centred is very general and fail to ensure a reasonable level of usability. Instead, we have suggested some areas that could

be improved in regards to communication, which include focusing on the entire system and not just the user-interface in regards to the citizens, and involving more stakeholders in the creation process of user-centred materials. Additionally, we suggested new materials to develop regarding vision, clarification of user needs and technical requirements. Our suggestion is that these initiatives are backed with conducting usability evaluations of all self-service solutions. The idea is that by conducting these usability evaluations, the self-service providers have to keep focused on creating self-service solutions that are usable and without significant critical usability errors. If all self-service solutions are evaluated and benchmarked, it will make it much easier for the municipalities to choose the most usable solutions.

This paper is based on interviews and other qualitative methods that have been used to discover the opinions of four out of the eleven IT companies that were involved in the development of the digital services. We have selected them to reflect the variety of IT companies, but we cannot guarantee that they are entirely representative. The findings presented in this paper indicate avenues for future work. The most urgent is to evaluate the actual usability of the systems developed so far. It is also vital to experiment with techniques for involving citizens actively in a user-centred development process for e-government applications.

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