Giving a voice to personas in the design of e-government identity processes

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Identity processes, such as enrolment and authentication, can have a negative impact on the user's experience. By using personas designers get a better understanding of the end-user during the design process. Personas represent a user archetype to assist in the development of [digital] products. However this technique involves a measure of subjective interpretation. Following a qualitative empirical exercise we extend the persona concept to include statistical capabilities in order to inform the decision making process through measurable and comparable feedback. This feedback indicates how acceptable an identity mechanism is for a specific group of users. For this purpose we propose calibrated personas, an extension of the persona design tool that encapsulates the necessary regression coefficients which can help us predict perceived workload and users' willingness to complete a task given specific design decisions.

Calibrated personas, thematic analysis, design tools, e-government, enrolment

1. INTRODUCTION

Personas as defined by Cooper (2004) are static archetypal representations of specific user groups, each bringing onto the drawing board more scope for discussion, and a deeper understanding of what the persona might want, like and dislike. These personas also facilitate group discussion while directing the designers' energy towards a unified direction. Various methods are proposed in requirements engineering literature, and many of these methods suggest the use of personas as a technique to understand the eventual user and inform design decisions (Faily & Fléchais, 2010a; Faily & Fléchais, 2011; Faily & Fléchais, 2010b; Olsen, 2004; Nielsen, 2004; van Velsen, van der Geest, ter Hedde, & Derks, 2009).

The following question motivates our work: how far can personas take us in making objective, rather than subjective, design decisions?

In this paper we introduce a technique that extends the classical persona building approach with quantitative information to help us model and predict user reactions towards specific design elements. We then introduce this design technique within the Volere requirements gathering and design process. Our initial studies focused on design decisions related to user experience (UX) in e-government identity processes, with particular interest on e-service enrolment processes.

However we believe that this design technique can be extended and adapted to other areas of systems design.

2. PERSONAS IN THE WILD

User-centred design demands that any design process revolves around the end user. Such processes should continuously seek to determine whether any new requirement would fit the end user's goals and aspirations. Personas are used to encourage the design team to focus their attention on the end-user throughout the initial stages of the product life cycle. Personas also bring forth scope for qualitative discourse, and it is up to the designers to accept and/or reject statements and assumptions brought forward throughout the design process. Sharp, Rogers and Preece (2007) consider personas to be the embodiment of user profiles which contain several user characteristics including attributes of the user's group, abilities, skills, level of knowledge or proficiency in the subject matter, experience (e.g. novice, expert), educational background, preferences, personal circumstances and so on.

From a practitioner perspective, the Volere process, which encompasses a widely adopted set of requirements elicitation and design techniques, encourages the use of personas at several stages (Robertson & Robertson, 2006).

Faily and Fléchais (2011) propose the use of *Persona Cases.* These have been successfully used in a number of case studies as reported in (Faily, 2011). Persona cases attempt to legitimize the validity of personas by grounding their characteristics in, while making them traceable to the originating source of empirical [qualitative] data (Faily & Fléchais, 2011). Nonetheless, although legitimacy of personas is increased due to traceability in hard evidence it does not add to its usefulness in providing objective guidance throughout the design process. We propose the introduction of predictive statistical parameters to personas allowing designers to make informed design decisions based on measurable and comparable results.

3. STARTING POINT - THEMATIC ANALYSIS

Thematic analysis helps us gain a deeper understanding on design decisions that can have a negative impact on eventual users. In a previous study (Porter, Sasse & Letier, 2012) we argued that identity mechanisms can make or break an e-government service, and thus we were interested to understand how users generally perceive existing enrolment processes and which aspects bothers them the most. Users are goal oriented, and any step that takes them away from the original goal will be treated as a hurdle. Security tasks, as opposed to production tasks, are generally not conducive to reaching the original goals faster and thus such tasks can be considered as hurdles which would in turn make a system less attractive, while possibly reducing its acceptability.

We carried out an empirical exercise to determine the main points that cause workload and frustration in e-service enrolment processes. The investigation focused on issues and negative experiences encountered by internet users, from which five design factors emerged. This exercise was carried out in two phases: the exploratory phase during which we explored the major themes occurring in such experiences and an extended investigation based upon the initial findings. The exploratory phase consisted of unstructured interviews with nine participants generating over 2.25 hours of transcribed recordings while the second phase included an additional 11 participants and over three hours of transcribed recordings. Participants' ages ranged from 18 to 35, 40% of whom were female. All participants had at least a secondary level of education and were regular internet users (daily). During the first set of interviews participants were asked to talk about their negative experiences and issues encountered while enroling for online services. The interview was guided by a few questions in order to touch upon various types of online services, including e-banking and e-government. After transcribing the audio we then started coding the data corpus following Kathy Charmaz's guidelines and adopting techniques from Grounded Theory. Open coding allows the researcher to discern possible theories from the available body of data. The process starts by identifying core theoretical categories (themes) which are evidenced from the transcriptions. As coding progressed we started to understand common elements across participants' views on the topic at hand. The second step of the process was Strauss and Corbin's practice of axial coding, where we started relating identified categories to subcategories in an effort to synthesize and organize the data in an attempt to understand the main relationships, properties and dimensions of each category following open coding where data is initially disassembled into separate and distinct codes. Axial coding reconstructs the data as a coherent whole (Charmaz, 2006).

We identified a number of codes that were more dominant earlier in the process and a number of themes started to emerge. These themes were then used as the basis for the second phase of the investigation in which a semi-structured interview was designed and conducted with an additional eleven participants. After coding and analysing these two data-sets five common meta-themes emerged:

(i) Frustration caused by delays
(ii) Frustration caused by interruption of daily routines
(iii) Frustration caused by the number of form fields in online forms to recall
(iv) Frustration caused by the number of new credentials to create
(v) Frustration caused by specific levels of workload given the type of service

From the data collected it was also noted that user behaviour is highly affected by other indirect variables, including the compulsion and frequency of a specific service and the number of alternative providers that offer the same services.

It was immediately clear that this information might be of interest to designers however it does not guarantee usefulness. For instance, it can be assumed that people don't like delays however designers need a way to understand the potential impact that different intensities of delays introduced in a process (e.g. activation by email vs. activation by post) have on specific groups of users for a specific type of service. Although interesting and useful for HCI researchers, a thematic assessment (presented through code maps, families and relationships) may not necessarily be meaningful or effectively useful for designers and practitioners. For this reason we used the themes that emerged from our data to build a quantitative model with which designers could objectively predict and

measure the impact of specific design decisions on users. For this purpose we adopted personas as the basis for this model. Our proposal aims to extend personas with statistical properties for the various design factors (elicited from the identified themes) which would then provide a way to generate immediate, grounded and measurable feedback on specific design alternatives.

4. OPERATIONALIZING THEMES

The themes listed in section three shed more light on what designers need to consider while making design decisions on e-service enrolment processes, however these provide no means to measure and compare the relative advantage of one process over another. Traditionally designers would use personas to inform the prototyping process. These prototypes would then be used to obtain feedback from potential users. 'User walkthrough' is another user-centric technique and is generally coupled with low or hi-fidelity prototyping; however none of these techniques scale up. It is prohibitively lengthy and expensive to conduct a significant walkthrough with each change in design, however such changes may finally have a significant impact on the user experience. We introduced the persona calibration process in (Porter, Sasse & Letier, 2012). This process allows researchers to measure the sensitivity of different groups of people (represented by personas) towards the different design factors identified through the thematic analysis. In order to do so we first need to express these design factors in measurable units, as shown below:

Table 1: Design factors and their units of measurement

Design factor	Examples	Unit
Delays	E.g. Activation email sent after a couple of minutes	None, Slight, Major
Interruption	E.g. User is asked to visit a registration office in person	True/False
Items to remember	E.g. Number of form fields that need to be populated	Integer
Items to generate	E.g. Username & passwords, PINs	Integer
Overall Workload	E.g. Overall workload level as a result of the above factors	Integer

During the calibration exercise participants are presented with a set of pre-defined tasks, each of which represents a fictitious enrolment processes. These tasks cover as many design factor combinations as possible. Extreme configurations are also present within the set of tasks (e.g. from a simple email/password registration process and up

to lengthy and laborious processes which also require physical travelling). For each task the user is asked to complete a feedback form which includes six NASA-TLX workload rating scales and four Likert scales that capture the user's willingness to complete the task at varying levels of service usage compulsion and frequency. This would also provide us with insights on the participants' attitude towards the different workload dimensions.

When a group of participants, represented by a persona, complete the calibration exercise, the data is then extracted and prepared for further processing (see Figure 1). SPSS is used to create statistical models, one for perceived workload (generalized linear model) and another for the willingness to complete the task (binary logistic regression model). These models provide us with coefficients that explain the group's attitude towards individual design factors (shown in Table 1), and how different combinations thereof can affect perceived workload and the users' willingness to complete the task.

5. PERSONA GROUPS IN ACTION

We built an online tool (*Sentire*) that provides designers with a collaborative environment to produce deliverables suggested by the Volere requirements elaboration and design process. A persona library is built within the tool holding a collection of personas from various projects that can be reused across existing and new projects. Each persona is associated with a persona group that in turn holds the statistical coefficients generated via previous calibration exercises. New personas are added to the library when designing new systems, unless suitable ones already exist. This tool is also extended with an online interface for the calibration exercise. The more participants are involved during calibration sessions the more fine-tuned predictions become, thus improving the persona's feedback on design alternatives. However a statistical saturation point, beyond which marginal improvements deteriorate, exists.

According to the Volere process, systems are defined in terms of Product Use Cases (PUC). Each PUC is composed of a number of steps which could include tasks such as enrolment and authentication. The designer annotates these security steps by specifying the measurements for the design factors identified earlier (see Table 1). Also PUCs are generally categorized according to their legal usage requirements and projected frequency of use. Once use cases are defined, annotated and associated to specific personas, designers could then generate a report that indicates a) the probability that this design will be accepted by the associated group of users and b) the predicted level of perceived workload.
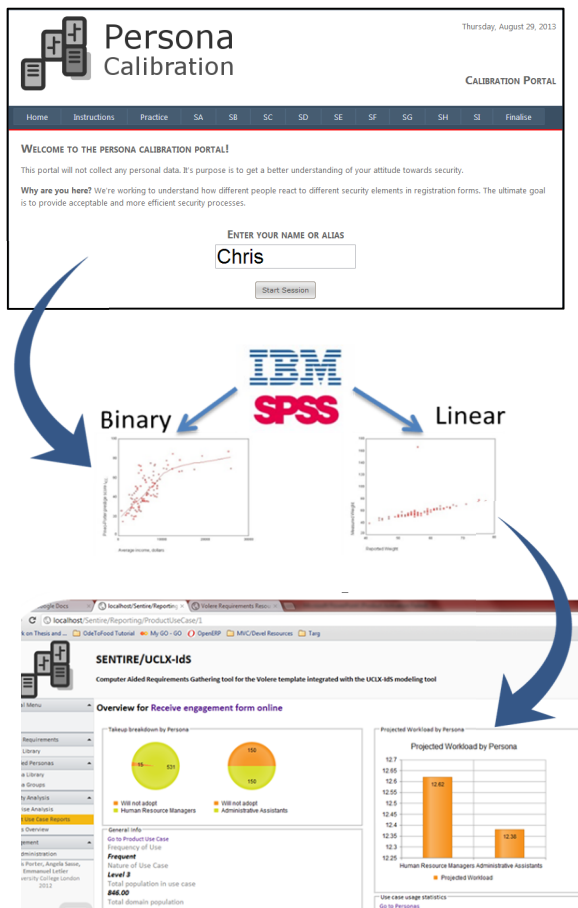
Figure 1: *Persona calibration and design feedback*

If results are not optimal, designers could use this information to inform the next design iteration. This allows for an inexpensive iterative design process with measurable and comparable user feedback provided at design time through calibrated personas.

6. CONCLUSIONS

In this paper we outline an approach that utilizes the output of a thematic study to underpin a low-level and re-usable modelling technique to inform the design of identity related processes within e-government services (enrolment processes in particular). Rather than providing practitioners with qualitative insights, we use these to build a software engineering technique that extends personas as a design tool. Personas are central to the design process however they are susceptible to subjective argumentation. Extending personas with a quantitative representation of their attitudes towards design factors adds a measurable, comparable and re-usable dimension to the design experience.

An evaluation of this technique has been carried out in a real-world project (with the Employment and Training Corporation in Malta) with positive and encouraging results.

Researchers need to abstract and operationalize qualitative results and provide practitioners with tools that enable them to make measurable, low-level and fine-grained design decisions. Nonetheless, close collaboration is still required between the two. We believe that the technique we propose in this paper could be adopted as a design-pattern for use in other domains.

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