Persona Cases: A Technique for Grounding Personas

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ABSTRACT

Personas are a popular technique in User-Centered Design, however their validity can be called into question. While the techniques used to developed personas and their integration with other design activities provide some measure of validity, a persona's legitimacy can be threatened by challenging its characteristics. This note presents Persona Cases: personas whose characteristics are both grounded in, and traceable to their originating source of empirical data. This approach builds on the premise that sense-making in qualitative data analysis is an argumentative activity, and aligns concepts associated with a Grounded Theory analysis with recent work on arguing the characteristics of personas. We illustrate this approach using a case study in the Critical Infrastructure Protection domain.

Author Keywords

Personas, Grounded Theory, Design Rationale, Critical Infrastructure Protection

ACM Classification Keywords

H.5.2 User Interfaces: User-centered design

General Terms

Design, Human Factors, Security

INTRODUCTION

Personas represent archetypical users, and embody their needs and goals [5]. Essentially, personas are behavioural specifications, embodying the salient characteristics of a class of stakeholders a design needs to serve. They were proposed as an antidote to the bias of software developers who, without explicit guidance about an unseen user community, may build systems appealing to their own interests. Yet, personas are a paradox. A behavioural specification of sorts, their most endearing characteristic is that they do *not* look like specifications; they have names, jobs, feelings, and goals they want to fulfil, sometimes irrespective of the purpose a system was designed for. But what happens when a stakeholder challenges a persona? A developer may be unhappy

about some system feature which directly appeals to some aspect of a persona. One way the developer can argue his case is by refuting some aspect the persona, weakening its legitimacy, and calling into question other characteristics of the persona as well. Chapman & Milham argue that, as fictional artifacts, personas cannot be falsified and, therefore, disproved [4]. They further argue that appealing to the rigorous use of interviews and ethnographic research also fails to validate personas, as specific examples of data cannot be provided to prove their accuracy.

Although Chapman & Milham argue that interviews and ethnographic approaches are not sufficient to validate data-driven personas, these are considered necessary by the two dominant approaches for building personas. In the first of these approaches, behavioural patterns are identified based on how interviewees cluster around particular behavioural variables elicited from the empirical data [5]. In the second, factoids are culled from the empirical data, before a group-based affinity diagramming exercise is carried out to induce behavioural clusters [3]. In both cases, sense-making activities are used to induce behavioural clusters upon which narrative descriptions of personas are written.

The data analysis associated with affinity diagramming is analogous to the qualitative data analysis approaches used in social-science inquiry. A standard methodology used for such analysis is Grounded Theory [6]: an inductive research method driven by sensitising research questions. However, rather than culling factoids directly from data, Grounded Theory involves coding data transcripts to elicit concepts relating to these questions. Moreover, although both approaches induce emerging themes from data, Grounded Theory also involves drawing out relationships between thematic concepts, creating memos with insights from this analysis, and preparing papers describing the theory resulting from the analysis; Corbin et al. [6] suggest that this latter act of writing clarifies thinking and elucidates breaks in logic. Finally, Grounded Theory is also supported by Computer Aided Qualitative Data Analysis tools; these can manage large data-sets, and support theory development by managing codes, memos, and automatically visualising emerging conceptual relationships.

Faily & Fléchais demonstrated how Grounded Theory could be used to develop a theory from which personas were derived [7]. Although the validity of their personas was obtained by integrating them into the design of secure systems, the problem of validating personas remains. Even though the

Grounded Theory artifacts were available during the building of the personas, they were not once the personas were used in practice to elicit requirements in focus groups. This semantic gap between Grounded Theory artifacts and persona narratives became problematic when questions were raised about characteristics of one of the personas in this study; this subsequently led to the creation of a new persona.

Recent work [9] has examined how Toulmin's work on developing practical arguments [11] can be aligned with the characteristics of personas. This work suggests that a characteristic is analogous to a *claim* being made as part of an argument, and a proposition reflecting an assumption about this characteristic may act as *grounds* of evidence, or a *warrant*: a rule of inference describing how the grounds contribute to the claim. The origin of a warrant's assumption is the *backing* knowledge for believing the claim, and assumptions may also be used as *rebuttals*, which challenge the validity of the claim. Finally, a *modal qualifier* indicates the degree of certainty about the claim.

If treating a persona characteristic as a defensible argument reduces the gap between empirical data and personas, aligning these claims with the argumentative discourse associated with Grounded Theory models may close it. To this end, this note presents the *Persona Case:* a persona whose characteristics are both grounded in, and traceable to their originating source of empirical data. We present an overview of this technique, before illustrating how it was used in a case study. We conclude by discussing further findings from this work, and suggest further directions for research.

APPROACH

Our approach for developing Persona Cases is driven from a Grounded Theory model; this model constitutes a collection of thematic concepts, and a set of relationships between them. The model is induced using data elicited from interviews or ethnographic research. Our approach does not prescribe guidance for applying Grounded Theory, nor does it prescribe the use of any specific qualitative data analysis tool. Nevertheless, the use of a software tool with some form of visualisation support is important. In addition to helping identify related themes as analysis progresses, visual models open the analysis to scrutiny when the results of analysis are reviewed by other team members.

Step 1: Summarise propositions
The first stage involves identifying the most salient thematic concepts, and eliciting propositions associated with them. These concepts are selected based on the most grounded and networked concepts in the Grounded Theory model of core themes; these represent the key themes that the Persona Case being developed needs to explore. The propositions are based on the quotations associated with each of these selected themes. These propositions are factoids because while accepted as fact by the participants, these may not always be established. For example, the quotation: *"The worst thing that could happen on a sewage site is that it would flood something"* could be reworded as the proposition *"The worse case scenario on a sewage site is a flood"*.

Step 2: Argue characteristics
The next stage involves enumerating and arguing each relationship in the Grounded Theory model. This involves succinctly describing the claim (or claims) justifying each relationship; this claim represents a potential characteristic of a persona. To justify this characteristic, propositions are selected as its grounds or warrant, and the modal qualifier will be associated with this based on the analyst's confidence in this relationship. Propositions which may rebut this characteristic are also recorded here. Such a rebuttal might arise if there is debate or disagreement about some aspect of the Grounded Theory model. Also associated with each characteristic is the type of behaviour the characteristic represents; these types are based on behavioural variable types in [5], which will be one of Activities, Attitudes, Aptitudes, Motivations, or Skills.

Step 3: Write persona narratives
The final stage involves writing a supporting narrative for each section characterised by the behavioural variable types. This narrative should be commensurate with the elicited persona characteristics and, as such, act as supplemental validation of the personas; if a commensurate narrative cannot be written then the characteristics and propositions should be reviewed in line with the Grounded Theory model. There may be a number of reasons why a narrative cannot be written to be consistent with the elicited characteristics. One reason is that not all characteristics may be relevant because they cover poorly grounded themes, or the characteristics are not relevant to the context of analysis. In this case, it is reasonable to omit characteristics if incorporating them leads to the persona becoming more elastic. Another reason is that multiple personas may be needed to reflect the elicited persona characteristic. In this case, characteristics should be sorted into natural groupings using affinity diagrams; these characteristic groups will then form the basis of separate personas.

RESULTS

Case Study
Information security officers at Critical Infrastructure organisations need to contend with a drive for increased automation, decreasing budgets, ageing infrastructure, and the threat of terrorism. It is, however, a well known problem that situating security controls that users find unusable will lead to ignored or compromised security [2]. We undertook joint work with a UK water treatment company to develop an information security policy to provide guidance to staff working at water treatment plants. To aid in this process, personas were used to voice their concerns during the development and revision of the policy. One of these personas, Barry, was pre-developed and represented a roaming technician working within a particular geographic region associated with a plant; the process for developing Barry is described in [7].

Using the Persona Case technique, a second persona was developed, Rick, to represent a plant operator. We visited 4 different water-treatment works and held in-situ interviews with plant operators and related stakeholders; interview questions dealt with the nature of work undertaken, including
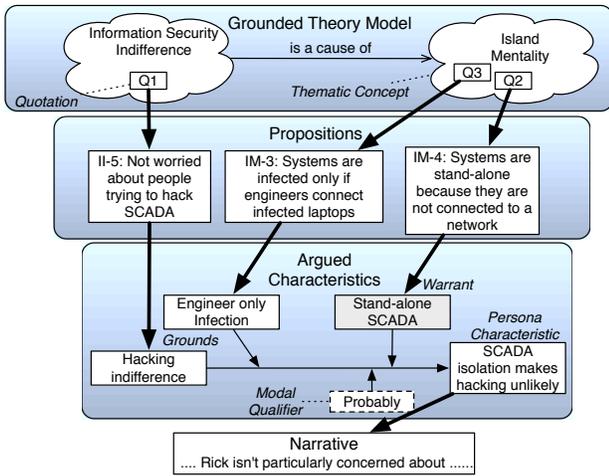
Figure 1. Contribution of Grounded Theory to Personas

Q1, Q2, and Q3; these quotations were coded with the *Information Security Indifference* (Q1), and *Island Mentality* (Q2, Q3) concepts:

- Q1: *Am I worried about people that want to hack my system? No, not really.*

- Q2: *Of course, security has always been an issue. Predominantly, what you'll find is that our systems are stand-alone, and they are not connected to the network. If they are then, in very limited cases, there could be an island network where a screen over here is looking after a site 8 miles up the road.*

- Q3: *If they work on a system and didn't have that, if they had to bring in their laptop with a cable and connect it in then, yes, if some guy infected their own laptop by doing other things, this could infect your own work. That's the only thing that could get infected because it's linked to all the other systems.*

As Figure 1 illustrates, the propositions representing Q1, Q2, and Q3 are *Not worried about people trying to hack the SCADA systems*, *Systems are stand-alone because they are not connected to a network*, and *Systems are infected only if engineers connect infected laptops* respectively.

Duplicate or superfluous quotations were omitted from this step. Examples of such quotations included plant shift-specific comments, and references to clean or waste water treatment operations out of scope for this study.

Argue characteristics

A sheet was added to the previously created spreadsheet to argue each association between the thematic concepts. Each row in this sheet represented a relationship, with columns for the characteristic claim being made, the behavioural variable type, grounds, warrant, backing, model qualifier, and possible rebuttals. The modal qualifier was subjectively assigned based on the grounding of the underlying quotations; the greater the grounding, the more confident the qualifying noun was. Table 1 describes the components supporting the persona characteristic *SCADA isolation make hacking unlikely*.

what plant operators were responsible for, who they worked with, and how they obtained help if necessary. Plant operators were also asked about important artifacts and activities, and the sort of problems they often face. In total, 6 interviews were held, and each interview lasted approximately an hour.

Following the interviews, the transcripts were subject to a Grounded Theory analysis; this analysis was supported by the ATLAS.ti software tool [10]. Following an exercise of open and axial coding, 243 quotations were associated with approximately 200 initial thematic concepts; these concepts were eventually refined down to 61. Conceptual relationships were visually modelled in one central model (containing the most networked and grounded concepts), and 4 submodels. These were based on process impact, work routine, information security indifference, and site knowledge. By applying our approach, Rick was developed on the basis of 32 persona characteristics (11 Activities, 7 Aptitudes, 11 Attitudes, 3 Motivations). Each characteristic reflected a conceptual relationship, and underpinning these were 126 propositions associated with 34 concepts.

In the following sections, we describe how this approach was used to derive the following paragraph from Rick's Attitude section:

Rick isn't particularly concerned about people trying to hack into the SCADA system he uses. "The only way the SCADA will get infected", Rick says, "is by an instrument tech plugging a virus infected laptop into it".

Summarise propositions

A spreadsheet was used to catalogue propositions derived from quotations associated with the selected thematic concepts. Each proposition contained two components: a sentence containing the proposition itself, and a phrase acting as an abstract for this sentence. In our example, the paragraph of interest was derived from the following three quotations,

Table 1. Characteristic argument example

Relationship	*Information Security Indifference* is a cause of *Island Mentality*
Characteristic	SCADA isolation make hacking unlikely
Behaviour Variable Type	Attitude
Grounds	II-5, IM-3
Warrant	IM-4
Backing	Island Mindset concept
Qualifier	Probably
Rebuttal	None

Like the previous step, not all relationships were included in this analysis. Reasons for omission included a lack of grounding, and relationships which were grounded in overly site-specific data. Another reason was that the analysis itself led to new insights into the Grounded Theory model which,

when investigated further, rendered a relationship superfluous.

Write persona narrative
Information about personas, including its narrative and characteristics, were stored in the CAIRIS (Computer Aided Integration of Requirements and Information Security) tool [1]; this tool supports the argumentation model presented in [9]. The spreadsheet contents were imported into CAIRIS, and persona characteristics automatically generated from these. Rick's validating narrative text was entered into CAIRIS, and associated with the generated persona characteristics.

Applying the Persona
Both personas were used to help elicit policy requirements. In total, 102 policy requirements were elicited, and these were placed in context by describing how the personas participate in 5 different work activities, e.g. fixing broken instruments and resolving reservoir water-level warnings. However, the Persona Case was found to be particularly useful when used in focus groups. On one occasion, a domain expert challenged a policy of disabling USB access to plant workstations by suggesting that Rick might bring letters or other documents into work with him. However, when Rick's characteristics and supporting elements were reviewed, it was found that this behaviour would be atypical; adding this constraint would not negatively impact Rick's working practices.

DISCUSSION AND CONCLUSION
The data used to derive Rick was sufficiently homogeneous that a single persona encapsulated most of the characteristics elicited. To explore the scaleability of this technique with more heterogeneous data, we used it to derive personas from a larger Grounded Theory model, containing 300 quotations and 90 thematic concepts; this model was a product of a published Grounded Theory analysis of Security Culture [8]. Despite the model's size, a similar number of characteristics, 31, were yielded; the breakdown of these characteristics were 6 Activities, 3 Aptitudes, 14 Attitudes, 6 Motivations, and 2 Skills. However, the characteristics were sufficiently diverse that, following an affinity diagramming exercise of the characteristics, 3 different personas were elicited. These personas represented a clinical researcher (Claire), an application developer (Tom), and a system administrator (Matt).

Although Claire, Tom, and Matt were not used in any subsequent design activities, discussions with stakeholders from the study in question suggest that the personas were accurate archetypes of their respective user communities. These findings suggest the re-use potential for other Grounded Theory models towards the design of personas. For example, existing theories about privacy for different domains might be easier to digest by software developers in the form of a persona than a conceptual model and accompanying discourse. These extensions do not, however, guarantee that a Toulmin model is the best bridge between all possible qualitative models and User-Centered Design artifacts. Further research into applicable techniques from the Design Rationale community should be examined to determine their applicability.

In conclusion, this note makes a number of contributions towards more grounded personas. First, we make the case that personas *can* be independently validated, by using argumentation as a bridge between Grounded Theory and personas. Second, we have presented a step-by-step approach for developing personas which is both traceable to its empirical data, and well argued. Third, we validate our approach using a real world case study of contemporary interest. Finally, we have presented some consequences and opportunities afforded by our work for future research.

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