

Usefulness of Personas to Support Requirements Engineering Activities

Could personas play a part in Requirements Engineering activities?

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Requirements engineering encompasses a variety of activities aimed at understanding and documenting customer desires and needs. Different types of activities have been distinguished for RE including eliciting, documenting, analyzing, and managing requirements. These types of activities are generally carried out by software engineers and business analysts. It is important to note these activities are not necessarily carried out in order, and some may not be performed at all.

A common technique in the Human-Computer Interaction field (HCI) is the concept of modeling system users on personas, which fits into their “Design Thinking” process. The concept of a persona captures behavior models of users that will interact in some way with the system. They are fictitious, specific archetypes that are made up as representations of target users. Designers use personas as a means of gaining insight into users needs, behaviors, and goals. They were first introduced in 1999, and have been a staple in HCI research ever since.

So if personas have been proven effective in UX design, could they also play a part in the requirements engineering activities? In which of the requirements engineering activities would personas be most effective?

If business analysts and software engineers integrated personas into their RE activities, perhaps they could help provide a further understanding and illustration of their customer's needs. Let's see how effective personas are when applied to requirements engineering activities.

Eliciting Requirements with Personas

In requirements engineering, eliciting requirements can be a very difficult task. Customers cannot envision the exact solution they want, and there is often a range of target users for the system with different desires for the system's performance. Personas can be created in parallel with eliciting requirements. In order to do this, Goodwin recommends that interviews are performed with potential target users. Questions should be designed to elicit qualitative data on users including their behaviors, goals, and traits in order to gain more insight into what they would truly require from the system. Having this qualitative data is generally more beneficial than the quantitative data that gets collected from surveys, as it provides a more in-depth discussion about the user's thoughts, opinions, feelings and hard facts.

Personas provide a lot more detail for technical teams than what a generic actor shows in use case diagrams. They give a more exhaustive list of scenarios that can be generated through various viewpoints of each persona. Hence providing a deeper understanding of how real users would interact with the system and helping find missing requirements at an early stage of the project.

Personas have proven to be effective for identifying non-functional requirements through their insights into the thoughts and feelings of users as they interact with the system. These insights allow realistic requirements around performance, reliability, portability, and availability to be created.

Another interesting take on personas is the idea of using them to create a model of people who may want to act maliciously with the system. These can be known as a persona non grata (PNG), as the archetypal user behaves in a harmful way. Using PNG's allow for the technical team to elicit and define nonfunctional mitigation requirements that would prevent the PNG's from acting maliciously. Since the threat modeling gives a representation of the potential motivation and abilities of these users, it can give more clarity on where vulnerabilities of the potential system could be abused.

Should you use personas when eliciting requirements?

Pros

- Offer a deeper understanding of the target users behaviors and goals
- Augment other requirement elicitation techniques to generate more requirements
- May find requirements missed by other techniques

Cons

- Interviews can be time consuming to prepare for and perform
- Can lead to conflicting requirements through conflicting needs and goals

Documenting Requirements with Personas

Requirements documentation is an important activity in requirements engineering as it bridges the gap between stakeholders and system builders. Good documentation of requirements provides a contract between technical teams and clients and is the basis for acceptance of the produced system. Requirements of a system can be documented in many forms, including natural language, formal definitions, models and diagrams.

Developers may more readily question a requirement that does not have a supporting use case and specific persona/s associated with it. By explicitly documenting the relationship between a requirement and a persona the developer can understand the background and the motivation for the requirement more easily. By documenting which persona’s needs a requirement is satisfying you are able to convince a developer of the necessity of that requirement.

“Personas support establishing connections between further requirements engineering methods and documents”

Natural language requirements specify requirements as text and, generally, follow a template for consistency. Personas provide a character reference who can slot into these templates as a contextual representation of who would be getting value from the requirement. This really helps to bring the requirement to life. Natural language requirements also help to document non-functional requirements, by linking these to personas you give a concrete example of how they would expect the system to be behaving in terms of quality. Figure 1 provides an example of a use case with a supporting persona integrated.


Manager of Bank	Check amount of money is in stock
<div><div>Sam Maurice, 42</div></div> <div>Married, father to three children, plays golf in his spare time.</div> <div>Manages the bank at ABC Ltd and spends over 40 hours a week at work. He is responsible to ensure there is always enough money at the withdrawal stations at any time</div>	<div>As a Manager of the Bank</div> <div>I want to check how much money is in the stations at any time</div> <div>So that I make sure that it never runs out of money.</div>

Figure 1. Persona and Use Case Relationship

Personas can also aid the construction of goal modeling when documenting requirements. Since the personas provide an insight into user goals and behaviors, it allows for more clear mapping of interactions with the systems with the target users goals in mind.

Should you use personas when documenting requirements?

Pros

Cons

- They provide a contextual representation on who a user story is providing value for
 - Increases the number of scenarios to be created in use case diagrams, as viewpoints are used rather than actors
 - They aid the construction of goal modeling
- Unrepresentative personas could lead to time wasted documenting unwanted requirements

Analyzing Requirements with Personas

Requirements analysis contains activities related to refining requirements, relating them to user needs and finding constraints. Analyzing requirements also includes the estimation of requirements size along with their priority.

Personas can be used to select a subset of requirements to produce a system that still meets the users’ needs with a minimum viable product. By considering each requirement and whether it satisfies a need or goal of a persona Software Engineers are able to pick and choose certain requirements over others.

A method has been created for prioritizing requirements based on the value of requirements for each persona. A matrix known as a weighted priority matrix is created for this, as shown in Figure 2.

Requirements	Persona Weights (x/100)			Weighted Priority
	Trent (weight = 20)	Daniel (weight = 40)	Victoria (weight = 30)	
Req 1	2	2	2	180 (2*20 + 2*40 + 2*30)
Req 2	2	2	-1	90
Req 3	0	2	1	110

Figure 2. Example Weighted Priority Matrix

Each requirement is assigned a value based how useful it is for the specific persona, for example:

- -1 - The requirement has a negative impact on the persona
- 0 - There is no impact on the persona
- 1 - There is some value for the persona
- 2 - The persona gets a lot of value from this requirement

From this, the weighted sums can be calculated for each requirement. This gives an indication on the priority of each requirement and therefore have these personas support the analysis of requirements.

Should you use personas when analyzing requirements?

Pros

Cons

- Can guide requirement prioritization by ranking requirements on the importance of each persona
- Can provide a formally documented matrix to justify requirement prioritization
- Provides guidance on which requirements for an MVP
- It is hard to see how personas would be helpful for estimating of requirements

Validating Requirements with Personas

Requirements Validation ensures that we are building what the client actually wants, as well as building the system in the right way. When validating requirements we must consider the content of the requirements, the quality of the documentation of requirements and whether there is agreement between stakeholders on the requirements.

Personas are great documents to show stakeholders of a project. They can be used to validate to the client that the technical team understands the target users of a product, or if not that the persona is updated. Having personas in these conversations help move away from the personal opinions of stakeholders, so that decisions about user needs and requirements can be based on empirical data.

Personas can be used in resolving conflicting requirements by prioritizing one persona's needs over another. This can be used in both win-win and win-lose resolution techniques to guide the modification of requirements to resolve the conflict.

Personas can also be used to verify the content of requirements. By considering each persona's needs and wants you can identify requirements that don't seem to fit any particular user's needs and need further consideration.

A type of matrix has been developed to help validate that requirements are being prioritized correctly based on the persona's significance. These are called Personas-Viewpoints-Scenario Matrices (PVSM), as shown in Figure 3.

		PERSONAS	Linda Rose, the busy graduate student and software programmer (primary persona)		John Lim, the high energy tech savvy instructor (primary persona)	SCENARIO FREQUENCY COUNT
		VIEWPOINTS (VPB)	<Linda Rose, Part-Time Graduate Student, Starbucks (mid-work day)>	<Linda Rose, Part-Time Graduate Student, Home (evening)>	<John Lim, Teaching Faculty, Office (morning)>	
SCENARIOS (titles)	Scen 1	Browse courses	✓	✓	✓	3
	Scen 2	Register courses	✓	✓		2
	Scen 3	Check student schedule	✓	✓		2
	Scen 4	Review student records	✓	✓		2
	Scen 5	Review financial aid		✓		1
	Scen 6	Make online payment		✓		1
	Scen 7	Submit grades			✓	1
	Scen 8	Get class list			✓	1
	Scen 9	Check faculty schedule			✓	1
	Scen 10	Check pay information			✓	1
SCENARIO COUNT (per Persona-Viewpoint)			4	6	5	15

Figure 3. Personas-Viewpoints-Scenario Matrix

This matrix generates information that provides the ability to validate that each persona had a number of scenarios proportional to its importance. For example, a primary persona should have a higher count of scenarios than that of a secondary persona. If otherwise, this gives an indication that either the scenarios, or personas importance need to be reviewed again. It also helps to display the significance of a scenario - if there is a higher frequency of scenarios referred to by the personas, this validates that this scenario should have a high priority.

Should you use personas when validating requirements?

Pros

- They provide validation for the importance of scenarios based on the PVSM
- The PVSM validates the proportion of scenarios relevant to each viewpoint

Cons

- The PVSM is time consuming to create properly , especially when there are many requirements and viewpoints.

Managing Requirements with Personas

Users of a system evolve over time. As such their satisfaction levels with different features change. This change can be measured using the Kano model. For example, a feature that may have initially been categorised as Delight can come to be categorized as Basic as users start to take features for granted. Personas that categorise these users need to be updated to accommodate these transitions from wants to needs. Modifying these personas leads to reconsidering requirements that linked to the persona's old wants and needs. In this way, personas can be a great tool for evolving a system's requirements over time.

Should you use personas when managing requirements?

Pros

- They can give insight on which requirements need to be updated.
- They can fit in with agile processes by iteratively evolving over time

Cons

- Personas could become outdated and invalid when revisited
- They have to be updated when trends of the target users change

Final Remarks

While we have found a place for personas in each type of requirements engineering activity, we believe that they are most effective in eliciting and validating requirements. By offering a deep understanding of target users behaviours and goals, personas can be very effective at giving more context to requirements, and help with understanding non-functional requirements. In terms of validation, the Personas-Viewpoints-Scenario Matrix provides a solid framework to compare and contrast requirements with viewpoints. These help to both show validate the importance of scenarios, and check the proportion of scenarios relevant to each viewpoint.

We believe that Software Engineers and Business Analysts should definitely consider integrating personas into their requirements engineering activities. By using qualitative data to represent their target users, personas have ways of enhancing each requirement activity to help in understanding and illustrating their customer's needs.

References

[Empowering Requirements Engineering Activities with Persons](#)

[How Personas Support Requirements Engineering](#)

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[Guidelines for Integrating Personas into Software Engineering Tools](#)

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[Enriching requirements analysis with the personas technique](#)

[Meet Elaine: A PersonaDriven Approach to Exploring Architecturally Significant Requirements](#)

[Persona-centred information security awareness](#)