# Using personas to understand city residents' information needs and evaluate city information services

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## Abstract

In increasingly complex cities, residents have information needs relating to accommodation, utilities, healthcare, public safety, transport, training and employment. These information needs are met by different providers, including city governments. To be effective, such information services must be inclusive and provide for the specific needs of residents. So providers of information services need tools for understanding the information needs of diverse city dwellers and designing effective information services.

Personas are one such tool, used in software design. A persona is a hypothetical archetype, constructed through a rigourous process, based on empirical induction. Personas are used to assist software designers to envision users, as a communication tool, and to evaluate the design of software. This research investigates the process of using a grounded theory approach to construct personas representing different kinds of city residents and reflects on the potential for personas to lead to better designed city information services.

Interviews were conducted with purposely selected participants at two sites in Johannesburg and these were used to construct five personas with different information needs. These personas were then used to evaluate online municipal services provided by the City of Johannesburg and to make recommendations for improvements. The paper reflects on the process of constructing the personas, as well as the value of using personas to understand the information needs of city residents and evaluate the effectiveness of information services.

## Keywords

Persona, Smart City, Information Need, Information Service, Grounded Theory

## 7. Introduction

Life in cities is complex as individuals negotiate securing shelter and services, finding work and other resources, and identifying and affiliating to appropriate groups for work, social and leisure activities. Residents have to navigate a wide range of different systems and to do this, they need information. The complexities of city life are reflected in the complex information needs of city dwellers (Cole, 2011). Understanding information needs, and how residents go about meeting them, makes it possible for the providers of information to design better services, with the ultimate goal of making it easier to live in the city.

The process of understanding information needs and the best ways to meet them has been the subject of information systems requirements gathering research and practice

for some time (Cheng and Atlee, 2007). This work originated in the design of information systems for organisations, where information needs could be defined in terms of the organisation's purpose and processes. However, as more widely used information systems have emerged, particularly those that are embedded in consumer products, new tools for understanding information needs have been developed. Among these is the use of personas as an analytical device (Aoyama, 2005, 2007; Pruitt and Grudin, 2003; Faily and Flechais, 2010, 2011).

As the task of providing for the information needs of city residents is in some ways similar to that of providing for a diverse set of customers, personas may be useful tools for designing information-based services for smart cities. This research investigates the use of personas in understanding the information needs of city residents and evaluating the services that provide for these needs.

## 8. The role of information in city living

City residents make use of a wide range of different types of information (Lee and Lee, 2014). This may be information relating to finding accommodation, about services such as water, electricity and refuse collection, about learning and employment opportunities, or about political issues that impact their lives in the city. It might also be information related to transportation, healthcare, or to leisure activities. A so-called smart city takes advantage of information technologies to provide such information in ways that are easy to access and immediately relevant to the individual (Hollands, 2008; Komninos, 2002, Lee and Lee, 2014). Such technologies also enable providers to collect information about residents and the uses they are making of the information provided in making choices about their lives in the city. The information collected as residents go about their daily lives can in turn be used to improve the services offered and to provide better information.

City information services are provided by the city itself, but also by consultants to the city, private companies, research groups, NGOs and individuals. Providing effective information services depends on having a good understanding of the information needs of the people that will use the services, but this is difficult in most cities because city residents are very diverse. Without a comprehensive understanding of the information needs of all residents, information services may be offered that address the needs of only a subset of people in the city.

## 9. Personas

A persona is defined as a "hypothetical archetype of an actual user" (Cooper, 1999). A persona includes descriptive information about an imagined individual such as a typical day in their life, their job description and work activities, their home and leisure activities, their goals, fears and aspirations, and preferred ways of communicating. Personas might also include information about the individual's attitude towards and ability to use technologies as well as information about the size and influence of the market segment that this persona represents (Pruitt and Gruden,

2003) or, in the provision of city information services, the extent of the population represented by each persona.

Personas do not exist in isolation. Designers of information services are interested in how personas behave in specific scenarios which support their individual end goals (Pruitt & Grudin, 2003). The scenario is the contextualised setting of the interaction between the person and the information source (such as a web site, a software application or a printed notice on a notice board) (Aoyama, 2005). For example, a resident who wishes to buy a house has a need for information about houses for sale and this results in the scenario of conducting an online search for houses to buy.

Using personas in the design of information systems has a number of benefits. Personas result in better designs because they help designers to envision an actual user of the system, thus preventing the design from being biased to the designers' conveniences, purposes and preferences (Aoyama, 2007; Pruitt and Grudin, 2003, Faily and Flechais, 2011). Personas serve as a communication tool, within the team designing and developing an information system, and between the team and the commissioning client. They have been known to generate empathy, among designers and developers, towards users (Faily and Flechais, 2010). Personas can also be used to guide the design of marketing materials for informing different potential users about the system (Pruitt and Grudin, 2003) and to guide the evaluation of information systems (Aoyama, 2007).

Personas have been criticised as being open to being challenged and changed arbitrarily, and in response well-defined procedures have been developed for basing personas on evidence and empirical induction (Aoyama, 2005, 2007; Faily and Flechais, 2010, 2011). Our approach echoes that of Faily and Flechais (2010, 2011).

## 10. Purpose of the research

The purpose of this research was to test the process of creating personas in the context of city residents using city information services and to construct a preliminary set of personas for the City of Johannesburg that could be used, with some refinement, in future smart cities research. The research objectives were as follows:

1. To construct personas representing the information needs and preferences of residents of Johannesburg.

2. To compare the information needs and preferences of the constructed personas to the information services offered on the City of Johannesburg website, in order to evaluate the effectiveness of the City of Johannesburg website.

3. To reflect on the feasibility of using personas in understanding and developing city information services.

The scope of the study was limited to residents of Johannesburg, with information needs that could be met by the City of Johannesburg. The study did not include the information needs of tourists or potential investors in the city.

## 11. Data and analysis

The personas were constructed from data gathered through semi-structured interviews with city residents. Interview questions were based on the items in persona templates described by Aoyama (2007) and Pruitt and Grudin (2003). Questions were included about personal characteristics, interests and circumstances; skills in, attitudes towards and access to information technologies; engagement and attitudes towards government services; past and present information needs and the sources of information used. Interviews were conducted at Thuso House Customer Service Centre as well as the Johannesburg City Library. These two sites were selected because they attract large numbers of residents from a range of suburbs, including different income groups and demographics, hence providing access to a variety of residents.

Respondents were purposely selected in order to obtain appropriate variety, as well as commonality that would form patterns and ground the findings reliably. Potential respondents were invited to participate based on perceived gender, ethnicity and age, as well as who they were with (for example parents, children or other partners) from which we inferred family circumstances or social circles. Although the library did attract large numbers of residents, few library patrons were over the age of eighteen and this limited the number of respondents interviewed at the library. Respondents were interviewed in English, in the public spaces, and interviews were recorded with their permission.

Sixteen interviews were conducted with people between 18 and 70 years of age; four were unemployed, five were employed, six were self-employed and one was employed part-time. Eight of the respondents were African, four Caucasian, one coloured and three of Indian descent; nine were men and seven were women. Although the sample is not representative of the city's residents, it did give a sufficiently rich mix of residents for our purposes.

Personas are documented using persona templates (Aoyama, 2007), foundation documents (Pruitt and Grudin, 2003) and narrative descriptions (Faily and Fléchais, 2010). We made use of a persona template with attributes selected as discussed below. Using a grounded theory approach (Corbin and Strauss, 2008; Faily and Fléchais, 2010, 2011) and Atlas.ti software, the interview data was analysed using closed and open coding. Closed codes were used to identify some of the template attributes (for example the personal characteristics and circumstances) while open coding was used to understand others (like attitudes and information needs). As patterns in the template attributes emerged, personas were identified with specific themes and named.

In constructing the personas, information gathered from individuals is combined and decomposed so that a persona may combine attributes from several individuals and the attributes of one individual may inform more than one persona (Aoyama, 2005). The attributes selected are often demographic, but must relate to the scenarios of interest. In our case, we are interested in residents' information needs and the ways in which they satisfy these needs. So we included in the template personal characteristics (age, gender and marital status), life circumstances (employment and economic situation), attitudes (towards the city, information and technology) and hobbies. These characteristics were inferred from the collected data which typified each persona. A name and an image were added to personalise each persona and aid in envisaging an actual resident.

## 12. Five personas and their information needs

Five distinct personas emerged from the data: the techno-stressed old lady, the unemployed homeowner, the self-sufficient business woman, the community hero and the young and connected hustler. The characteristics of these personas are summarised in Table 1. This set of personas is not comprehensive because it is based on a limited set of data. However, the personas are well grounded in the data (Faily and Flechais, 2010) and serve to illustrate and reflect on the processes of creating and using personas.

| Name and description | Personal characteristics | Personal circumstances | Attitudes | Hobbies | Profile picture |
|---|---|---|---|---|---|
| Elisabeth van de Baker, **the techno-stressed old lady** | Caucasian woman of 65, married | Retired former bookkeeper, owns a car, doesn't need "all the things that young people need" | Values neatness and order; using technology is stressful; you can't trust the internet | Reading and visiting friends | |
| Chennons Williams, **the unemployed home owner** | Coloured man of 33, with a wife and 2-year-old son | Unemployed; worked at a printing store; owns a house; uses public transport | Patriotic and optimistic; positive about interactions with the city | Watching and playing soccer, socialising | |
| Kuyelwa Mbonani, **the self-sufficient business woman** | African woman of 47, married | self-employed financial consultant; owns a car | Wants simplicity and minimal services that are efficient and effective | Reading, playing tennis, walking and running | |

| Name and description | Personal characteristics | Personal circumstances | Attitudes | Hobbies | Profile picture |
|---|---|---|---|---|---|
| Poupa Chandrapal, **the community hero** | Man of Indian descent, 39, with a wife and two children | Police officer, owns a car and uses public transport | Loves his city and people; community-minded; enthusiastic about the city's plans | Watches soccer, active in his religious community, and loves reading | |
| Perseverance Mtimora, **the young and connected hustler** | African bachelor of 24 | Self-employed business owner and student; driven, with many interests | Young, ambitious and tech-savvy; connected and well-informed | Plays piano and drums, socialises with family and friends, runs to stay fit | |

**Table 1: Characteristics of the five personas**

The information needs identified by the respondents are shown in Table 2 in descending order of frequency. It is not surprising that information about service tariffs was frequently sought because people come to the customer service centre to resolve queries with their services accounts. Community-specific information included planned power and water outages, the identity of meter readers and safety. Respondents showed interest in the city's plans and initiatives for development, and were seeking information about jobs, public transport, leisure and cultural pursuits, as well as housing.

| Information about | # of references | % of references |
|---|---|---|
| Service tariffs | 17 | 31 |
| Community-specific information | 7 | 13 |
| Jobs and job opportunities | 6 | 11 |
| Public transport information | 6 | 11 |
| City development plans | 5 | 9 |
| Leisure and cultural pursuits | 5 | 9 |
| Housing information | 4 | 7 |
| Other | 5 | 10 |
| **TOTAL:** | **55** | **100** |

**Table 2: Information needs identified by the respondents**

The sources that residents rely on for information include general internet searches (26% of references in the interviews), or the online information provided by the city (19%). But many also rely on the physical service centres (23%), as well as family and friends (16%). Several respondents reported that they first tried the City's web site but did not find the information they needed and so had to go into the service

centre. Other information sources mentioned were traditional media (newspapers, magazines, radio and television) as well as observing others.

Table 3 below reports the information needs of each persona and how they meet those needs. In order to understand how each persona engages with online information, the table also lists technology devices that each persona is able to use when seeking information, the activities that they use the internet for, and the number of hours they spend online each day.

| Name and description | Information needs | Information sources | Devices | Online activities | Hours per day |
|---|---|---|---|---|---|
| Elisabeth van de Baker, **the techno-stressed old lady** | To log an account query. To check the status of a query. Information that is neat and indexed. | Customer service centre, friends and family, media outlets, general internet | Personal computer (phone is hard for her to see) | Online banking and general searching | 0 – 1 hours |
| Chennons Williams, **the unemployed home owner** | Utility account query. Proof of unemployment for debtors. Government job vacancy information. Service outages in his suburb | Media outlets, general internet | Mobile phone (used to use a computer at work) | Job hunting and general searching | 0 – 1.5 hours |
| Kuyelwa Mbonani, **the self-sufficient business woman** | Feedback on her services account. Information related to her community and neighbourhood. Queries over Skype. | Customer service centre, general internet | Personal computer at home and mobile phone | Online banking, email, research for her business | 0 – 4 hours |
| Poupa Chandrapal, **the community hero** | Services account queries. Community information. City success stories, like park renovations. City development plans. | Media outlets, general internet, city website, customer service centre | Mainly his phone, also his laptop | Reading, research and general searching | 3 – 6 hours |
| Perseverance Mtimora, **the young and connected hustler** | Identity of meter readers in his suburb. Crime stats and housing options. Wants to upload own meter readings and make online payments. Community notices and updates. City development plans. | General internet, City of Johannesburg website, customer service centre | Personal laptop and smart-phone | Online banking, email, research for study/ business, general searching, entertain-ment | 6-10 hours |

**Table 3: Persona information needs and behaviours**

The information needs of the personas were compared with the information provided on the City of Johannesburg's web site by completing a walk-through of selected information-seeking scenarios associated with specific personas. The scenarios examined were: to query a water and electricity account, to look for job opportunities, to identify planned service outages, to learn about city development plans, and to identify the meter readers for an area. The walk-throughs were performed using the devices available to the personas and took account of the experiences and outcomes that respondents reported in the interviews. The results are summarised in Table 4.

| Scenario | Personas | Experience | Outcome |
|---|---|---|---|
| Billing query on a personal computer | Aged techno-stressed lady; Self-sufficient business woman | Tries following menu options, but gets "page not found" errors. Tries the quick help and gets a list of FAQs, but can't find the question she wants to ask. Finally uses the search option. The search term "query" returns 682 results. One says Accounts and following this link gives information about logging a query by phone and in person, but not online. | Information need not met |
| Billing query on mobile phone | Unemployed homeowner; Community hero | Navigates to the site's home page. Tries a number of tabs and links that appear to relate to billing information, but cannot find the information he needs. | Information need not met |
| Look for job opportunities on mobile phone | Unemployed homeowner | Navigates to the site's home page. Cannot find any links that relate to employment information. | Information need not met |
| Find service outage times on a personal computer | Self-sufficient business woman | Navigates to the site's home page. Identified "service alerts" link which gives details of planned outages. Her suburb is listed and the information is available. | Information need met |
| Find service outage times on mobile phone | Unemployed homeowner; Community hero | Navigates to the site's home page. Identified "service alerts" link which gives details of planned outages. Suburb is not listed. It is not clear if this is an omission or whether there are no planned outages for his area. | Information need partially met |
| Identify the meter readers for an area on a personal computer | The young, connected hustler | Navigates to the site's home page. Types "meter reading" in the search field. The system returns 511 results. The first result is a link to the Electricity page which lists the meter readers for each area. | Information need met |

**Table 4: Scenarios evaluated and outcomes**

From this analysis it is clear that many information needs of residents are not being met by the City's web site and consequently, residents are turning to other information sources. Respondents reported that coming into the service centre was inconvenient, but that it had the capacity to address their information needs because

the service centre is interactive; they get direct feedback from an individual. By contrast, the web site was not interactive.

## 13. Reflecting on the use of personas

The personas revealed new ways of thinking about city residents. For example, while the needs of homeowners are clearly present in the smart city, as are the needs of the unemployed, the intersection of these two groups, the unemployed homeowner, was unexpected and presents a new set of information needs. So it appears that the use of personas will give a more inclusive view of the city's residents and a more comprehensive understanding of their information needs.

The process of constructing personas using interviews created well-grounded archetypes of the city's residents. The interviews allowed the respondents to express themselves and resulted in a more in-depth understanding of the interviewed residents. However, to create a comprehensive cast of personas, representing all the residents of the city, using this method would be time consuming. Some authors have used surveys to collect data for constructing personas (for example Ayoma, 2005), but this approach lacks the richness of interviews. Some combination of data based on surveys and interviews will probably yield the best results.

Aoyama (2005) cautions that the practice of naming the personas may make the personification too "strong" and this has been reflected in practice (Faily and Flechais, 2010). We opted to use a name (e.g. Kuyelwa Mbonani) and a descriptive title (e.g. "the self-sufficient business woman") for each persona. In working with the personas, the descriptive title seems to encapsulate the persona without the strong personification and we recommend this practice.

The personas assist in understanding the ways in which different people interact with information services. For example, it helped in doing the web site evaluations to think of the approaches that each persona might use. This would be even more effective if the city set up resident panels, like the persona user panels of Pruitt and Grudin (2003), of representative people who could assist in such evaluations.

One of the challenges in Johannesburg is ensuring that the information needs of residents are addressed equitably. Often the information needs of wealthier, more powerful residents are better provided for because private companies and individuals see business opportunities in doing so. Such residents are also more vocal and better able to lobby for their needs to be met. In South Africa, where there are deep inequalities and the need to provide redress for past inequities, equity of information provision is important. A comprehensive cast of city resident personas would bring the needs of a wider range of residents to the attention of those designing information services, highlight those who have pressing needs that are not being met.

This study was limited in the data collection with data being collected from only two locations in the city and only 16 interviews being conducted, and so the personas

reflect the types of people who make use of those locations. Future research might expand the cast of personas for the City of Johannesburg; construct personas for other information services; critique other information services used by city residents, and examine the use of these personas in the design of information services.

## 14. Conclusion

The construction of a comprehensive cast of city resident personas is feasible, although the process of arriving at such personas may need to be refined. Having a set of resident personas would facilitate user centred design and make it more likely that the information services provided in the city match the information needs of the residents. In addition, the personas could give a "voice to the voiceless", raising awareness of the information needs of residents who lack the capacity and influence to demand that their needs are met.

## 15. Acknowledgement

## 16. References

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