

# Psychological Personas for Universal User Modeling in Human-Computer Interaction

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**Abstract.** Applying techniques to understand the user needs and expectation in product development is important practices for find consistent strategies. However, available techniques need human interaction, is a psychologist examining a profile or usability expert capturing information about user's group. In this situation, data collection and analysis require a large effort and cost to make the purpose of knowing the user needs. This paper aims to create a set of personas from psychological profiles theory that define a generic model, clustering information about knowledge, skills, impulses and concerns, outlining action patterns of users diversity that exist today. This set of personas can be used in global solutions, considering universal usability aspects. Finally, the worldwide acceptance of psychological profiles allows updated and consistent personas, decreasing cost and increasing quality.

**Keywords:** Personas-Psychological Profiles-User Modeling-User Profile.

## 1 Introduction

Personas are a support technique to identify users profile in product development. They provide easily and directly communication about who are the users in a particular product. Based on the concept of user-centered development, this technique provides necessary information to designers for make decisions.

Are several methods to do effective personas, like: target groups interview, mining database, subjective observation. These methods give a set of personas that represents only the profiles considered, personas created within a particular context based on project domain. Theoretical definition [1] and lifecycle [2] of personas say that the set of created personas is particular to the project, a reuse requires additional effort about evolution or mutation of each persona.

With time, electronic devices and systems will be used for everyone requiring development based on different profiles. In this purpose, universal usability becomes a critical requirement in a product design [3], considering diversity of global projects, without race discrimination color or national origin, adding value to universal design and accessibility [4]. To reach universal usability, designers need to consider that a lot of people will use the product in practical applications [5].

Therefore, this paper aims to contribute to a set of personas that represent diversity of existing users nowadays, and create a general model for product development.

Applying established theories in a field of psychology and administration, defining people based on their behavior [6] with personas theory, set up inputs for creation of psychological personas, and applied field research validating the hypotheses of this work.

The paper is structured as follows: state of the art presentation of personas and psychological types. Methodology used in development and results. Beyond that is presented the result of the application of Psychological Personas into a project of Research and Statistic based on Digital Collection of Patient Medical Record in Center User Telemedicine (PEAP-PMPT, in Portuguese) which Personas are created by the use for Universal User Modeling in Human-Computer Interaction. The entire research field used to confirm the hypothesis, conclusions and proposals for a future work.

## 2 Personas

The persona concept was first cited by Carl Jung [6], with define that humans tend to act differently in each social environment. Was subsequently proposed by Alan Cooper [1], applying personas as a practical tool for interaction design [2].

Robert Barlow-Busch [2] compared traditional methods between personas with marketing area applied to industry highlighting those that were considered remarkable advantages. Personas do not solve problems of designers, but they are additions to the toolbox of any person who seek a better experience for the end user of a product or service [2]. Personas are a descriptive model of users who represent a real group of people and their characteristics [1]. These models focus information about knowledge, skills, motivations and concerns, describing action patterns that a user group has on a particular project [7][8], allowing the information exchange between user profile and the project team [9]. This general representation of involved users enables the development of projects that respond diversity [3].

Bagnall [10] describes the personas technique as powerful design tools in order to exchange information assisting the creative team for develop interactive systems. Calde, Goodwin and Reimann [11] highlighted that the successful use of personas depends not only from the experts who created them, but the quality of resources and sources chosen for data. Other applications scenarios of personas technique generating satisfactory results can be analyzed in McGinn e Kptamraju [7], Thoma and Williams [12], Khalayli et al [13], Adlin et al [14] and Pruitt and Grudin [15]. The combination of the Personas technique with other techniques of product development has shown promising results, the emphasis on the process of user-centered design can be considered a bridge between organizations, user requirements and system [16]. In summary, the composition of Personas can be formulated based on creating information or sources, thus shaping the personality of Personas [3].

The presented papers serve as validation both on validity of personas technique to assist in product development, and in constant need to collect data for personas composition. This research considers the personas as a method that supports the creation of new products with the knowledge of the user profile in a target project.

Considering projects that respond to diverse populations (e.g., interfaces for e-gov), it is necessary to be able identifying the target audience with help of additional techniques that increase information about user behavior. For this, the acknowledgment of the user psychological type can help to identify it as a persona and consider your needs and preferences in the interactive process.

### 3 Psychological Types

Proposed by Jung [6], the psychological types are models of attitudes that explain the process by which people see themselves and the world, a basic guideline that indicates the direction of the interests. Briefly are thought patterns in the execution of an action. These thought patterns are based on two activities: Capture information or organize information and reach conclusions.

With these assumptions, Jung [6] classifies every individual in four opposite pairs, each pair shows a set of personal characteristics: [E Extraversion/ I Introversion, S Sensation / N Intuition, T Thought / F Feeling, J Judgment / P Perception]. Finally these opposite pairs characterize, as a person will act in situations of preferences, decision-making, attention and experience.

Katharine Cook Briggs and Isabel Briggs Myers [17][18] concludes that the typology can represent a method to describe the difference between personalities and can be used in practice. In this way, the MBTI (Myers and Briggs Type Indicator) indicator was built to prove the psychological preferences through Jung's typology [6][19].

Davis [20], Ludford and Tervenn [21] investigate and check the effects of Jung's psychological types next to information on the performance of users within the context of information systems. As a result the authors had determined some connections between typology of each person to the organization and decision-making.

The authors of the articles cited above, as well Rosati [22], Bannerot [23], Chois and Deek [24][25], Harrington and Loffredo [26], Per and Beyoglu [27], Yan [28], Wang, Jing and Xue [29], Nichols, McPeck and Breiner [30], Li et al [31], Rosati, Russell and Rodman [32], Bell et al [33] and Yu [34] use MBTI as a tool to identify profiles from each group involved in their studies, proving that even in different scenarios, with different purposes, the indicator is considered effective.

People's values differ fundamentally from one another, Keirse [35] developed a classifier of temperaments, based on Jung's [6] and Myers [17][18]. The new classifier called Temperament Sorter (KTS-II) is an instrument that uses the answer of 70 questions to decide the user's psychological type [36][37] and was used as a tool to characterize temperaments in some papers. Authors as Cha-Hwa and Mcleod [38] and Herman [39], use KTS-II to classify profiles in different scenarios, proving its validity, also confirming diversity proposal in psychological type's theory.

The presented papers with different purposes and different people of distinct pieces of world have the same human behavior, following patterns, actions sequence based on the structure of personality, allowing us to say that psychological types can describe, explain and interpret these patterns.

This paper presents a method that supports the process of identifying the user profile based on their activities and behaviors with the use of psychological types, making the information in the user's personality, completely characterize the contents of the user profile declared as persona.

The objective was to create a set of personas that can express any type of user, based on a theory proven in environments of psychology, psychoanalysis and administration, such as psychological types.

## 4 Psychological Persona Methodology

For the definition of Psychological Persona was used as a principle the four basic psychological functions identified by Jung [6]: thinking, feeling, sensation and intuition.

For each basic psychological function (mentioned in psychological type's session) is a set of psychological types related. The set of psychological types of each function is shown below: [Sensation (ISTJ / ISFJ / ESTP / ESFP), Intuition (INTJ / INFJ / ENTP / ENFP), Thinking (ISTP / INTP / ESTJ / ENTJ), Feeling (ISFP / INFP / ESFJ / ENFJ)].

In addition to the definitions made by Jung [6], was used terms and descriptions provided in the work of Keirsey [35] and Myers [17], [18]. The personas are created and declared in a standard format according to each approach. Table 1 represents the structure of psychological personas declaration.

**Table 1.** Structure of Psychological Personas Declaration

Item	Description
(N)Name	Used as communication facilitator between professionals.
(Pf)Psychological function	Personas were created from each basic psychological function, and this function is a direct relationship between the persona and the psychological types.
(Pt)Psychological set of types	Each basic psychological function comprises four psychological types.
(T)Temperament	Portrays personality of the individual, used to decision-making.
(Pfe)Professional features	Some professional features can be defined for each basic psychological function, featuring a more detailed look at the persona. Allowing the designer to understand the motivations and ways of each basic psychological function relating with other people and the project itself.
(Gc)General characteristics	This attribute is composed of the most important aspects of the declared persona

## 5 Results

From structure of declaration mentioned in Table 1, it was possible create four psychological personas displayed on Table 2, Table 3, Table 4 and Table 5.

**Table 2.** Persona Defined from Psychological Function Sensation

<b>Item</b>	<b>Description</b>
<b>N(Pf)</b>	Helen (Sensation)
	She has strong preference for information through the five senses and understands what is real. Is a person with a focus on direct experience, the perception of details and facts. Cares about the actual experience and always has priority over the discussion or the analysis of experience.
<b>Pt</b>	ISTJ / ISFJ / ESTP / ESFP
<b>T</b>	Its most remarkable characteristic is to be observant.
<b>Pfe</b>	Is a person who tends to respond to any situation in your life immediately, deals effectively with all types of crises and emergencies. Works very well with tools, equipment, vehicles and tools in general. Rarely trusts in insights and rarely makes mistakes of fact. Tends to be good at precision work. Finally, it is too impatient when details lead to complications, however values the conclusion.
<b>Gc</b>	Have a greater preference for using skills already learned, instead of learning new ones. It is a concrete person, realistic, practical and traditional.

**Table 3.** Persona Defined from Psychological Function Intuition

<b>Item</b>	<b>Description</b>
<b>N(Pf)</b>	Jessica (Intuition)
	Prefers information through a "sixth sense", which seems to perceive. She's very good at processing information in terms of past experience, future goals and unconscious processes. Things like that can happen, or what is possible, are more important to her than the experience of life itself. And because of his speed in the correlation between intuitive information with detailed information, it has great difficulty in separating their conscious interpretations of raw sensory data.
<b>Pt</b>	INTJ / INFJ / ENTP / ENFP
<b>T</b>	Introspective is the most remarkable characteristic of her, their beliefs and associations of ideas are always present in your daily lives.

**Table 3.** (continued)

<b>Pfe</b>	Is a person who processes information very quickly and very easily relates to, automatically, past experience with the relevant information. Like enough to solve problems, and hates routine. It has great hurry about learning new skills, much more than use them and often jump to conclusions. Works with lots of energy, fueled by enthusiasm, with slack periods between activities. It is very patient with complicated situations and always follows your inspirations. Finally, do not like to spend time with little things.
<b>Gc</b>	Do not like to do the same thing repeatedly. It is an imaginative person, who loves working with the original theoretical concepts to develop new ideas.

**Table 4.** Persona Defined from Psychological Function Thinking

<b>Item</b>	<b>Description</b>
<b>N(Pf)</b>	Rafael (Thinking)
	He has strong preference for organizing and structuring information to make decisions logically and objectively, a great sense of truth, with judgments derived from impersonal criteria, logical and objective.
<b>Pt</b>	ISTP / INTP / ESTJ / ENTJ
<b>T</b>	Its most remarkable characteristic is to be firm in their projects.
<b>Pfe</b>	He's a thoughtful and a great planner. Your decisions are taken impersonally, ignoring the wishes of the people. He needs to be treated with honesty and is able to relate to other people more rational. Like analysis and use logical for everything, often tends to hurt people's feelings without noticing.
<b>Gc</b>	He's extremely logical and critical, often considered difficult to handle.

**Table 5.** Persona Defined from Psychological Function Feeling

<b>Item</b>	<b>Description</b>
<b>N(Pf)</b>	Airton (Feeling)
	He prefers to organize and structure information at the time of decision making and personally oriented values. He has great advice for the emotional aspects of experience and prefers strong and intense emotions even negative, apathetic and warm experience.
<b>Pt</b>	ISFP / INFP / ESFJ / ENFJ
<b>T</b>	Its most remarkable characteristic is his charisma.
<b>Pfe</b>	Standards such as good or bad, right or wrong, define how it makes decisions. Always looking to be close to others and respect their feelings. Loves to please others even when things are not important, prefers harmony. Usually leaves their decisions be influenced by desires and preferences of others.
<b>Gc</b>	Always take their decisions based on what is right.

This set of psychological personas can be used within development lifecycle of any product, for this research, psychological personas were confronted with a case study.

## 6 Psychological Personas in Action

The case study identifies the patterns of attitude, behavior and temperament presented in Jung's theory. These patterns are validated in a dynamic group with people from different professions and in different positions.

The dynamic group aimed to identify the similarity of actions and comparison of data according to the model presented in personas based on psychological types. Was performed to monitor the implementation of the dynamic group for several days with different members, for only thus obtain the diversity needed to validate the model. Five days of group activities, totaling sixteen hours of work.

The dynamic consisted of a description of an image pre-selected by the psychologist who uses the dominant role of psychological type of each person as a criterion for group division. After the division of the profiles, all groups of people receive an image. It is requested that the group describe the image as best as possible, in order to describe it to other members. Thus, it was possible to identify the characteristics of people, allowing their subsequent analysis.

**Table 6.** Analysis Result of Similarity Between the Dynamics and Psychological Personas

Group	Users	Sensation	Intuition	Thinking	Feeling	Hit Rating
01	20	6	3	5	6	90,9%
02	18	5	4	6	4	95,0%
03	38	11	9	8	10	91,5%
04	48	12	10	17	9	86,5%
Total	124	34	26	36	29	90,9%

In dynamics execution, the behavior of each participant from each group, was observed and analyzed in contrast to psychological personas. Table 6 presents a summary of analyzed data, first column identifies analyzes performed on different days, second column identifies the number of people participating on dynamics, third, fourth, fifth and sixth columns identify the division of each group according to the psychological function. Finally, seventh column indicates the hit rating of each group in contrast to the psychological personas. This hit rating was calculated according to a threshold between 0 and 10 related to each existing items in personas description, in contrast to actions performed for each participants of the case study.

The results showed that 90,9% of the cases, psychological personas were satisfactory in its description, proving the hypotheses proposed in this paper.

## 7 Application Method

The application method to identify personas in a user group is composed of steps:

Step 1 – Questionnaire application: Apply KTS-II [35]. The KTS-II was chosen for a couple of reasons: (a) is the result of a published book (b) is quoted in numerous papers (c) use this methodology explained clearly in his book (d) is available for free on the internet [36].

Step 2 – Evaluation and definition of psychological types: Analyze the questionnaire and determine the psychological type.

Step 3 – Validation of the framework and personas: From the topic 'set of psychological types' presented in each of the personas defined in this work, with the definition of the user-defined type in step 2, it is necessary to frame this user among one of the personas that have been created.

Step 4 – Application of personas in the project: With the questionnaires of the user groups and their respective personas, you can define the most relevant to the project, personas and thus use them to better define the scope for the development since interfaces until the necessary processes.

In this step you will need, according to each project, define a percentage of cut to the personas used as the basis of the project. This step is exemplified in the table below.

**Table 7.** Sample Project

<b>Number of users who answered the KTS-II questionnaire</b>	200	
<b>Personas that represent each user</b>	<b>Users</b>	<b>%</b>
Helen	60	30%
Jessica	45	23%
Airton	65	33%
Rafael	30	15%
<b>Percentage cutoff for this project</b>	30%	
<b>Personas used in this project</b>	Helen and Airton	

In the project sample 200 users were used to define personas after they answer the KTS-II questionnaire, and each user was fit in a persona defined in the model. After defining a percentage cut, only the personas those are above this percentage fall to the project.

## 8 Conclusions

The personas theory contributes to bring users together, those responsible for the development of a product, whether for interface or system development. However, for a set of personas can insert value within the development group, these personas should be well developed and in connection with all aspects related to users.



The psychological personas were identified and implemented in PEAP-PMPT project. These personas were used to characterize the behavior of a group of 10 doctor's hospital participating in the project. The psychological personas helped identify new doctors to validate results of usability tests. These personas were used to document the profile of physicians and suggest improvements in the interface.

With a set of personas based on an already established theory in Psychology, descriptions and characteristics of this theory has been proven and validated, giving personas confidence necessary in relation to the users.

In this work, a personas work-related review exemplifies the above statement, with the psychological type's work-related review, which shows that it is possible to determine how personality dimensions, how to make decisions and the way people see the world, regardless of their location or culture. Thus, with the personas generated in this work, together with the case study, it is possible to characterize the personas concept of universal usability.

The method described is intended contribute to a support user profile identifying, through a set of personas that serves as data source for creative teams and product development. For future works, from psychological types theory is possible to create personas more specific or more generic than the proposed personas, thus creating greater comprehensiveness for new projects.

## 9 Future Work

From the theory of psychological types, you can create more specific or generic personas in comparison of those proposed in this paper, thus creating greater control to the professionals who have used personas. The identification of this new set of personas is through the same method proposed in this paper, also allowing simply a breadth of information to be handled in the most profitable.

Along with this work, it is also possible to validate a possible correlation between the personas created and habits in the use of technology, I can infer that there may be a consensus among most types who like technology and others less, or even get to the point of defining what some types use more communication vehicles such as e-mails and social networks and not others.

With the addition of these two future work, we can create personas with enough information to compose a Framework personas oriented psychology covering the population in order to facilitate both the collection of information in the analysis of target audience, as the user-centered development creating a repository of information where the developer can create a whole interaction between the system and the user.

And finally, with all the information from this framework, that may services to other areas such as marketing, to characterize target public campaigns, for teaching students to characterize and develop best in class activities, among many other applications.

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