



# A personality based adaptive approach for information systems



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## ARTICLE INFO

### Article history:

### Keywords:

Adaptive system  
Social networks  
Personality  
Interaction processes  
Collaborative learning  
Neural networks

## ABSTRACT

In every context where the objective is matching needs of the users with fitting answers, the high-level performance becomes a requirement able to allow systems being useful and effective. The personalization may affect different moments of computer–humans interaction routing the users to the best answers to their needs. The most part of this complex elaboration is strictly related with the needs themselves and the residual is independent from it. It is what we may face by getting personality traits of the users.

In this paper, we describe an approach that is able to get the personality of the users by inferring it from the social activities they do in order to drive them to the interactive processes they should prefer. This may happens in a wide set of situations, when they are deepened in a collaborative learning experience, in an information retrieval problem, in an e-commerce process or in a general searching activity.

We defined a complete model to realize an adaptive system that may interoperate with information systems and that is able to instantiate for all the users the processes and the interfaces able to give them the best feeling and to the system the highest possible performance.

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## 1. Introduction and motivations

Recent studies highlighted that to better satisfy goals of different users during a learning experience it is important to consider their personalities in order to find and deliver the best available material and to allow them being at ease (Chi, Chen, & Tsai, 2014). Other studies underlined that it is reductive to connect the employability only to the competence searching because it should analyse psycho-aptitude aspects in order to understand whether a user is recommended for a job, for a particular environment, for a work team, etc. (Crant, 2000). Moreover, as stated in Bologna (2013), during a game, a professional activity, an e-commerce tour or other kind of experiences that may be personalized, adapted, or simply chosen, keeping in mind these personal features should allow better understanding preferences and needs and easier satisfying them.

Thus, when an information system offers services to people, if it takes into account features of the users like the personality may improve its performance and the quality perceived by the users themselves. The main faced issue is the interaction between the user and a general-purpose system and which kind of personalization able to take into account personality aspects, we may adopt to allow individuals feeling better during this process.

In fact, in Nass and Reeves (1996) the authors claimed that people were inclined to treat media, usually computers in their studies, as if they were real people or real places, since the authors of Lewis (2013) assert that, when people interact with “something” having similar personality traits, their feeling is usually positive. This seems to be independent from the subject of the service itself and, thus, leads us to focus on the interaction with the user and on how we may improve it, allow users feeling better and, eventually, reach better results by collecting positive feedback.

The personality greatly influences our decision-making process; it can be a powerful tool in design (Aarron, 2011). When we develop software application by following new design approaches, we define “personas”. Each “persona” identifies a stereotype of user having interests, expertise and needs and asking something to the system that we should translate in specific requirements. This description helps us to understand who the people are and gives some idea on which kind of personality they have, which motivation moves them to use the system and how to design interface and system in order to meet their features. The impact of these aspects has been treated in many context as in Zhang and de Pablos (2012), Zhang, de Pablos, and Xu (2014), Zhang, de Pablos, and Zhu (2012).

In Tera, Hyun, and Fisher (2009) authors establish that differences between users do influence the efficacy of visualization and web application interfaces and, so, they should be considered as a part of a maturing theory of visualization and complex interface design. In domain-specific interface, users often share certain

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common problem-solving tendencies. By studying the group-specific inherent traits or behaviours of an expert cohorts, we may be better able to create visualizations that are discernibly more intuitively interactive in the environmental set for which they were designed.

Nowadays, systems usually have more than one interactive process with the user and many different interfaces. Often it is due to the needs to offer different accesses for different devices and connections. Well aware of this, we aimed to create a sort of plug-in for these information systems able to analyse the features of the users and create for them the best interactive environment by choosing processes and interfaces.

For the personality analysis, there are many theories and techniques. The first theories on personality tried to connect people to “personality stereotypes” having hard and schematic features. Carl Gustav Jung conceived one of these theories (Jung, 1971). Theories in the following years led in the mid-twentieth century to more elaborated approaches and models. In the following subsections, we are going to summarize them.

The following Section 2 underlines other works related with the proposed approach that is described in Section 3. Section 4 shows the results of an early experimentation and give some evaluation elements. The last Section 5 depicts conclusions and possible future works.

### 1.1. The cattel theory

In his explorations on personality traits, the psychologist Raymond Cattell found that the variations of the human personality should be explained by mean of a model having sixteen variables (Cattell, 1956). His model is based on a statistical procedure, known as factorial analysis. His research results originated the theory on 16 personality factors (16PF): Abstractedness, Apprehension, Dominance, Emotional Stability, Liveliness, Openness to Change, Perfectionism, Privateness, Reasoning, Rule Consciousness, Self-Reliance, Sensitivity, Social Boldness, Tension, Vigilance, Warmth.

This theory includes a test able to identify the personality of a persona with respect to the cited main traits. The evaluations adopt the International Personality Item Pool scale (Cattell, s.d.). For each factor, there are some features able to increase or decrease the evaluation.

The 16PF test is a set of questions that evaluate these main factors and some other wider ones, known as “global factors”. They are Introversion/Extraversion, Low/High Anxiety, Receptivity/Tough-Mindedness, Accommodation/Independence and Lack of Restraint/Self T Control.

This test, during the year, has been useful to evaluate personalities in both clinical and enterprise environments. Its limits are on the analysis of the evolutions and changes of the personalities and on the limited agreement on the number and nature of its factors.

### 1.2. Myers-Briggs type indicator

The Myers-Briggs Type Indicator (MBTI) (Myers, s.d.) is one of the most used test in the United State of America, especially for the selection of worker. This test is based on the theory of types of Jung (1971). The theory of Jung asserts that the different personalities have different way to perceive the world. There are four different channels and for each channel two different perception ways. These four dichotomies are Extraversion (E)–(I) Introversion, Sensing (S)–(N) Intuition, Thinking (T)–(F) Feeling, Judging (J)–(P) Perception.

The personality type is the result of the interaction of the preferences of a person represented by only one pole of each dichotomy. By combining these four indexes, we obtain sixteen different types of personality able to depict the profiles of the people. These

profiles underline attitudes, mechanisms under decision processes, relations with the environment, but it is not an evaluation of the personalities in terms of positive/negative judgement. The Myer-Briggs test allows, thus, professional consulting in finding the best profile for a particular need or the appropriateness of a person in doing a job or getting some material for particular issues.

However, the statistical validity of this test has been criticized during the years (Gardner, 1996) because it leverages simplistic dichotomies and tenuous results.

### 1.3. The Big Five theory

Costa and McCrae formulated the Big Five theory (Costa & McCrae, 1992). It asserts that the personality of a person comes from a set of innate and unique features. It gets together the factorial approach of Eysenck (1979) and the Cattell's theory.

McCrae and Costa identified five big dimensions of the personality:

- **Neuroticism:** tendency to experience emotional instability, anxiety, moodiness, irritability and sadness.
- **Extraversion:** excitability, sociability, talkativeness, assertiveness and high amounts of emotional expressiveness.
- **Openness:** imagination and insight, tending to have a broad range of interests.
- **Agreeableness:** trust, altruism, kindness, affection, and other prosocial behaviours.
- **Conscientiousness:** high levels of thoughtfulness, with good impulse control and goal-directed behaviours, tending to be organized and mindful of details.

These dimensions allow describing diversities of people and representing the point of convergence among measure models (i.e. 16PF). The Big Five theory differs the theory of types, thus the models inspired from it are different from the Myers-Briggs model. The main difference is on the way to evaluate some dimensions. For instance, the theory of traits evaluates introversion and extroversion as two extremities of the same concept, while the theory of types considers them as two attraction poles.

The measurement tool validated by Costa and McCrae is the NEO-PI (Neuroticism-Extraversion-Openness Personality Inventory Revised), a questionnaire structured by mean of the Likert Scale based on assertions semantically connected to behaviours to investigate and five possible alternatives of agreement: *Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree*. The test, by using high-score and low-score features, identifies the intensity of each personality trait of a person.

In literature there are many different tools adopting the Big Five approach. The most famous is the “Big Five Questionnaire” (Caprara, Barbaranelli, & Borgogni, 1993). This theory is often used to evaluate personality in organizational contexts because the test is reliable. The main critic to the Big Five model received is on the heterogeneity of the resulting psychological profiles and on its results in some countries having different cultural influences as in Hungary (Szirmak & De Raad, 1994) (De Fruyt, McCrae, Szirmák, & Nagy, 2004).

### 1.4. The Holland theory

The Holland theory (Holland, 1973) gives its attention to the relations between the individual and the environment and underlines the importance of the analysis on the evolutionary history in the evaluation of the personality by taking into account aspects like education, childhood and socio-economical context.

Knowing the types of personality and the information on the environment allows forecasting the orientation in education,

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