

CONTEXTUAL ANALYSIS AND MODELING OF PERSONAL WELLNESS

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Abstract: The healthcare paradigm is progressing towards preventive care and proactive services with holistic and personalized view on health and wellbeing. The concept wellness has been used to describe this holistic approach to health and well-being. Different wellness tools have already been introduced and some wellness applications are available to be used to manage and maintain personal wellness. With the technology advances like ubiquitous computing the number of different wellness systems will increase rapidly. To maximize the benefits of the new healthcare paradigm and wellness systems semantic interoperability is a necessity. Therefore there is a need for a personal wellness ontology which enables sharing of information between all actors in the wellness ecosystem. This study analyzes the context of personal wellness and starts the work on the personal wellness ontology by presenting a high-level information model of the domain. The results of this research help to take into account the different contextual aspects of wellness information covering also the privacy, confidentiality and security contexts.

1 INTRODUCTION

The healthcare paradigm focused on treatment of diseases is progressing to the direction of preventive and proactive care paradigm with distributed services and a more personalized, holistic and lifelong view on health and wellness (Nykänen, 2008; Koop et al., 2008). Healthcare delivery is seen as a broader continuum with empowered citizens and networked interoperable services. Future healthcare will focus on health, functioning, and wellbeing of citizens (Larson, 1999). The current health information systems and electronic health records are planned to support hospital-centric care and thus they are not able to support the personalized and preventive care paradigm.

The concept wellness has been used to refer to a holistic approach for health and wellbeing of citizens. Personalized wellness approaches focus on improved lifestyle and behavioral choices. Health promotion and education, and support for wellness approaches are major trends in the modern world and are becoming more visible through different media (Kickbusch and Payne, 2003). Wellness tools for self-management activities have been widely studied in different research projects and already there are several applications intended for

supporting wellness activities (Ahtinen et al., 2009; Varshney, 2007; Nykänen, 2008).

Wellness informatics focuses on enabling the citizens to stay well and manage their own health and wellness even without participation of healthcare providers. Wellness informatics is a human-centric approach where citizens are thought to be both information sources and users (Grinter, Siek and Grimes, 2010). Wellness informatics aims at helping citizens to collect their own data from multiple sources, to reflect their wellness, to support healthy living, to enable collaboration beyond provider networks, to allow people to collaborate with each other and to share their personal wellness information. Wellness data can include different measurement data, medical data, behavioral data, socio-economic and cultural data. It is a challenge to integrate all this data together and also to acknowledge the contexts of information (Grinter et al., 2010).

This study presents research focusing on trusted personal health and wellness information in ubiquitous environment (Nykänen et al., 2009). The aim of this research is to present a trusted context-aware information model for a lifelong personal wellness record and a security architecture for trusted use of multisource heterogeneous personal

wellness information. In order to enable semantic interoperability between the various wellness systems there is a need to develop an ontology which creates shared understanding and enables sharing of heterogeneous information among different actors and systems (Blobe et al., 2010).

The first objective of our research was to perform a contextual analysis on the personal wellness concept, how it is conceptualized and what kinds of external contexts are related to it. The second main objective was to create a high-level information model of personal wellness. In this paper we present modeling of the wellness concept and build the basis for the development of a personal wellness ontology.

2 METHODS

This study had three main methods:

1. A literature analysis to find out how wellness and personalized health is presented and defined in the literature and what are the common characteristics.
2. A contextual analysis to understand what wellness is and to model the components of personal wellness.
3. Focus group meetings to understand how normal healthy people conceptualize personal wellness and what kind of concepts are related to their personal wellness management and maintenance.

First we made a literature analysis to find out how wellness and a holistic view on health is seen and defined in the literature to conclude common characteristics, concepts and components of wellness. The focus of was on wellness, but because health, wellness and well-being are used interchangeably in the literature we had to concern also holistic health and well-being models (Kirsten et al., 2009). In the analysis we focused on holistic health, wellness or well-being, and on the components of the future health care paradigm.

After the literature analysis, we performed contextual analysis of the collected materials. This analysis helped us to understand what information is related to wellness and how citizens manage their wellness. The external contexts and other things affecting personal wellness were also modeled. As a result we could define the scope and the contents of the concept wellness.

Next, we organized two half-day meetings for small focus group to get empirical information about how personal wellness is understood and what

contexts are related to it. We were interested to model how normal healthy people conceptualize personal wellness. The focus group was composed on the department staff members, healthy young persons. Participants for the focus group were collected with an open call, on voluntary basis, and the number of persons participating in the meetings was 5 (1st meeting) and 4 (2nd meeting).

After the first meeting we created a mind map based on the discussion. Mind map was chosen as the tool to represent the information because it is easy to understand and to follow and most people are familiar with the technique. Also with the mind map we were able to do simple categorizations of concepts and conclude some basic relations in an understandable format. In the second meeting the mind map was divided into two, due to the received feedback that separation of the personal wellness and the external context would make the mind maps more understandable.

Based on the performed analyses and the mind maps we started to elaborate the model into a more formal representation. We used a modification of the entity relationship (ER) notation to represent the necessary concepts, properties and relations. The model did not follow strictly the ER-modeling notation because the purpose was to create a model which would be easy to understand and to modify by citizens who are not modeling specialists. The models were then discussed internally with the project team (4 persons) and based on the feedback we were able to make some modifications, to reduce redundancy and the gap in the abstraction levels between the concepts. The fourth small group discussion on the models was organized in our health informatics postgraduate student seminar where the models were presented and discussed and the participants (5 persons) were asked to give feedback and their views on personal wellness.

3 RESULTS

3.1 Literature and Contextual Analyses

In the literature, there exist several wellness definitions and they vary depending on the context. Often wellness is thought to be a balanced state of a healthy body, mind and spirit which creates a harmonious feeling of complete wellness (Myers and Sweeney, 2004; Larson, 1999; Oguz-Duran and Tezer, 2009; Mackey, 2009; Soomlek and Benedicenti, 2010; Kirsten et al., 2010; Kiefer, 2008). Most wellness models support health

promotion, prevention, and progress towards better functioning (Larson, 1999; Conrad, 1994; Sterling et al., 2010). Thus, wellness is seen as a high level concept integrating multiple domains (Schuster et al., 2004; Sterling et al., 2010; Kirsten et al., 2010; Kiefer, 2008). The concept wellness contains individuals' functioning as a whole and it acknowledges lifestyle, behavior, culture, beliefs, experiences and other issues affecting general life satisfaction (Oguz-Duran and Tezer, 2009; Mackey, 2009; Soomlek and Benedicenti, 2010; Sterling et al., 2010; Kiefer, 2008; Ahtinen et al., 2008).

Wellness is described as optimal physical, psychological and social wellbeing (Els and De La Rey, 2006; Larson, 1999; Soomlek and Benedicenti, 2010) and it focuses on an individual and on her specific needs and it may vary depending on the individual's age or living culture. Wellness covers means for changing lifestyles, adopting healthier behavior, and combining morality and health. Morality is seen in wellness actions when pursuing good life one should make decisions between good and bad actions for their health (Conrad, 1994).

Sweeney and Witmer (1991) developed the Wheel of Wellness model. Based on existing theories and research they identified factors influencing healthy living, quality of life, and longevity (Sweeney and Witmer, 1991). Myers and Sweeney (2004) elaborated the model further to a new one - the Indivisible Self which consists of five factors and sub-factors:

- The Essential Self; spirituality, self-care, gender identity, and cultural identity,
- The Social Self; friendship and love,
- The Coping Self; realistic beliefs, stress management, self-worth, and leisure,
- The Creative Self; thinking, emotions, control, positive humor, and work,
- The Physical Self; exercise and nutrition (Myers and Sweeney, 2004).

This model has contextual factors which affect an individual's wellness and behavior. These are local (family, neighborhood and community), institutional (education, religion, government and business/industry), global (politics, culture, global events, environment, media and community), and chronometrical (perpetual, positive and purposeful) contexts. Contextual factors are important when trying to understand human behavior (Myers and Sweeney, 2004; Myers and Sweeney, 2008).

Saylor (2004) has developed the Circle of Health model which defines health as optimal functioning, well-being, and quality of life. The model is divided into two sides. The light side focusing on activity and performance consists of energy, strength,

fitness, stamina, happiness, enjoyment, satisfaction, growth and development, occupational and/or social role, and performance. The dark side is about renewal and recovery including rest, relaxation, peacefulness, nourishment, social support, sense of purpose and meaning, balance, adaption, and resiliency. This model tries to combine balance, harmony, mind-body integration with more traditional western ideas such as physical, mental, spiritual, social, and role functioning (Saylor, 2004).

Kirsten et al. (2009) have developed an eco-systemic approach to health, well-being and wellness. It is based on two assumptions; Humans are complete persons with some distinguishable attributes which cannot be separated; and health, well-being and wellness should be contemplated multi-dimensionally and multidisciplinary. This approach consists of three elements and two outside contexts. The three elements describing the functioning of a person are biological, psychological and spiritual. The outside contexts affecting wellness are ecological context describing living and non-living physical environments, and metaphysical context focusing on symbolic abstract environment. The eco-systemic approach is a holistic and lifelong view where people, their health and contexts are distinguishable but inseparable (Kirsten et al., 2009).

All the four examined models acknowledge the holistic idea of health and wellness. They created a good basis for our contextual analysis because they all had a multidimensional view on wellness. Also they all emphasized both internal and external contexts and the relations between them. An exception is Saylor's (2004) the Circle of Health which focuses more on body-mind integration with balance and harmony and inner actions. Important in these models is the balance between different aspects of health, wellness and external contexts so all of them are much wider than the traditional concept of health. However, all these models had some deficiencies. They remain general; we needed more detailed analysis on the concepts, the properties and the relations. The models are also high level descriptions with limited conceptual analysis and they are presented in quite informal way. The models are created for different purposes with the focus more on assessment of wellness.

Our analyses result in that personal wellness seems to be a combination of physical, emotional, mental, intellectual, social, behavioral, occupational and spiritual factors which are affected by the environment and the external contexts. The concept of personal wellness is highly dynamic and heavily dependent on the context and cultural background.

People may have different views and emphasis on personal wellness and it may evolve during lifetime (Ahtinen et al., 2008). Finally, we concluded some common characteristics of wellness:

- Wellness is a holistic, multidimensional and multidisciplinary view on health and wellbeing,
- Wellness is a much wider concept than traditional view on health defined by healthcare; it acknowledges also environmental, emotional, intellectual, occupational, social and spiritual aspects of wellbeing.
- Wellness focuses on complete health and wellbeing, prevention and proactive services,
- Wellness is a dynamic and context dependent concept,
- Wellness is heavily affected by internal and external contexts and it may change over time.

3.2 Focus Group Work

Aforementioned models were introduced to the focus groups as a background material. Our analyses results were presented for the focus groups as two mind maps, the first one focusing on the personal wellness, things that are dependent on the person herself and can be affected, controlled, influenced, or managed by the person herself, and the second one focusing on the environment or the external contexts which affect personal wellness.

In the focus groups we elaborated further the mind maps and started to model the domain of personal wellness. We focused on the concepts and their categorization because they were used as a basis for the list of concepts related to personal wellness. These concepts were analyzed and revised to reduce redundancy and the gap between abstraction levels, and make them more understandable. As a result we were able to conclude a high level view on personal wellness.

Our contextual view on the personal wellness (Figure 1) consists of five main concepts which are lifestyle, emotional and mental wellness, occupational wellness, physiological information, and health. All the concepts are interconnected and they create a holistic view on personal wellness. These five main concepts are surrounded by two external contexts, social networks and the environment, which heavily influence personal wellness. So, finally our view is based on the seven main components which interact together creating a complete and holistic view of personal wellness. The analyses and the empirical feedback formed the

basis when we started to categorize the concepts into our view. We concluded the seven main components that create a high-level information model of the personal wellness (Figure 2.).

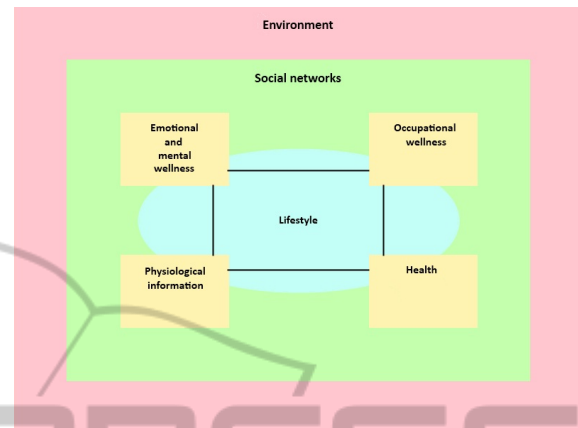


Figure 1: A contextual view on personal wellness.

4 DISCUSSION

Wellness is a research topic in many different scientific areas e.g. in medicine, public health, social work, mental health, health management and economics, and nursing (Mackey, 2009). The concept wellness is complex and multidimensional. Wellness is personal but dependent on the context and the cultural background. People may define and emphasize personal wellness differently (Ahtinen et al., 2008). With the analyses we were able to define the internal and the external contexts and list some of the main concepts of personal wellness. Also the multidimensional and multidisciplinary nature of wellness became very clear. It was important to start analyzing from a high-level because it enabled us to understand the scope and boundaries of the domain before the empirical research and the modeling.

The focus groups were a good method to approach the domain of personal wellness. With limited amount of participants we could approach the huge and complex domain in an organized manner and keep the discussions on track. However, the focus group work had some limitations. The group consisted of quite homogenous participants who were all quite young, healthy and educated persons so our model might lack the needed multi-perspective view. In the further empirical research we need to include more heterogeneous participants

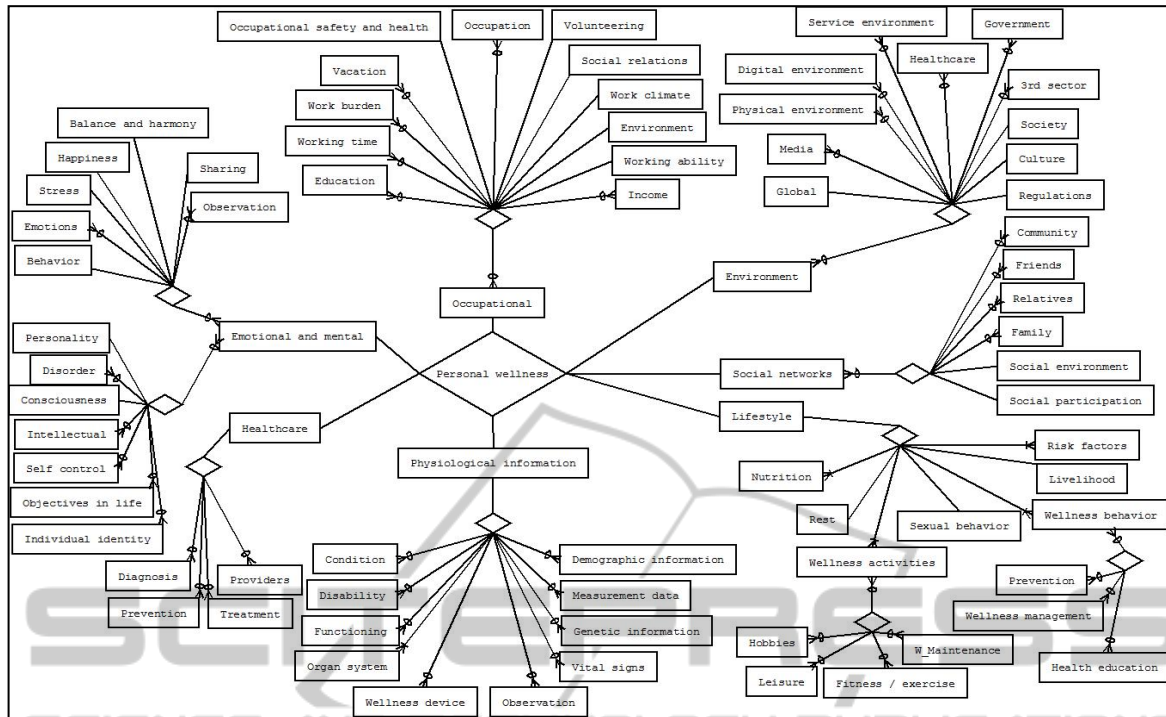


Figure 2: A high-level model of personal wellness.

to ensure that the model will acknowledge different needs and perspectives. We need people from different age groups, with different backgrounds and with different health statuses. The two mind maps developed with the focus groups described at a high-level how wellness can be conceptualized and what kinds of contexts are related to it. The mind maps showed how complex the concept is and how it covers more than just being healthy or free of diseases. Although the mind maps had their deficiencies we were able to utilize them with the analyses and start creating a high-level model of the personal wellness domain.

Our model divides the domain into seven main components. We have already categorized many of the related concepts, but the model is still quite informal. We need to analyze further and in more detail the different relations inside components and how cross-border concepts affect each other. The domain of personal wellness is challenging to model because it is dynamic and multidimensional and very context-dependent, it varies a lot between individuals and cultures. Our results will shed some light over the context of personal wellness and we can see what kinds of concepts exist and how they can be categorized and attributed.

In our research we have started to analyze the context of personal wellness with informal models because they can be understood by people without modeling experience, though the concepts are quite

abstract and the domain is complex. From these models we can find the core characteristics and scope of the personal wellness and we can proceed with our research into more formal modeling. The results of this phase enable us to do more empirical research with more participants in order to define the concepts and the relationships in more formal and detailed way. The goal is to integrate heterogeneous data in the ubiquitous wellness environment and to give us information how shared use of wellness information affects citizens' wellness management and how citizens can control and manage the use of their information (Nykänen et al., 2009).

The final objective of this research is to develop a context aware personal wellness ontology which takes into account the different contextual aspects of wellness information and also the privacy, confidentiality and security aspects. We need to model these as part of the ontology because most information is personal, private and confidential, and their processing is regulated by the legislation. The contextual aspects of all information entities need to be covered in the ontology because wellness concept is related to a multi-user and multi-system environment with heterogeneous data sources. When we include the privacy and the security aspects in the ontology we can ensure that citizens and other actors can dynamically control processing and disclosure of their information. An essential part of our further work is the validation and evaluation of

the developed models and the resulting ontology. We need to compare our results with the recent research results and to perform empirical evaluation with new participants in real life situations.

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