P4Well Concept to Empower Self-Management of Psychophysiological Wellbeing and Load Recovery

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Abstract — **Chronic health problems related to mental wellbeing are rapidly growing, calling for novel solutions focusing on individual as a psychophysiological being. We describe a novel technology-based concept for empowering citizen towards holistic self-management of her wellbeing: "P4Well" (Pervasive Personal and PsychoPhysiological management of WELLness). The primary focus of the concept is on management of stress and recovery from stress caused by daily life through improved health management strategies. The P4Well concept combines modern psychological methods with personal health technologies. The technologies include a web-portal and web-based tools, mobile phone with mobile client applications, wearable health monitoring devices, and different analysis methods based on physiological models for interpretation and feedback. The concept supports secured private expert consultation and peer-support through social media. Our driving principle is to recognize that an individual is the best master of her own wellness, and we target to empower her for realizing the fact.**

Keywords: self-management, stress, sleep, exercise, psychological mini-intervention, personal health systems

I. INTRODUCTION

Today, the increasing demands of work responsibilities and people's hunger for around-the-clock access to leisure and work tend to lead to stress and shortened sleep times. In 2004, more than 30% of the American adult population between the ages of 30 and 64 years reported sleep times of less than 6 hours per night [1], whereas still in the Sixties people slept for 8.0-8.9 hours per night on average [2]. In modern society, chronic stress has been included among risk factors for diseases such as hypertension and diabetes [3].

Many unavoidable stressors are common in working age population. The stressors, such as job strain, may ensue from psychosocial problems [4], an imbalance between efforts and rewards [5] [6], and/or a combination of high demands and lack of decision control at work [7] [8]. Biological susceptibility to stress stimuli plays an important role in determining the effect of stress on personal wellbeing [9]. The stressors can rarely be totally avoided, but stress recovery methods can help people cope with stress [10]. It is evident that regular exercise can help to protect people from health problems and diseases. Moreover, exercise can improve people's mental wellbeing and help them sleep better and manage their stress [11].

Mental health problems almost invariably induce absenteeism and lost productivity. The problems are rapidly increasing, and causing a majority of the occupational health care expenses. There is a clear need for interactive systems [12] designed to improve people's mental wellbeing and to help them cope with stress and sleep loss. Taking into account the limited health care resources in many developed countries, the emphasis of such system needs to be relied on prevention of health and mental problems based on self-management; before the psychophysiological problems of an individual become chronic.

Cognitive-Behavior Therapy (CBT) methods have been found to be effective for a range of mental health problems. Computerized Cognitive-Behavior Therapy (CCBT) programs delivered through the Internet have shown their effectiveness for mental wellbeing problems [13]. The National Institute for Health and Clinical Excellence (NICE) recommends CCBT as a primary intervention method for anxiety disorders, post-traumatic stress disorder, and depression [14]. The reported CCBT methods, however, do not fully exploit the available modern mobile and ambient technologies.

In this paper, we propose a technology-based concept to empower self-management of psychophysiological wellbeing through management of stress and recovery from stress. The proposed P4Well concept integrates several personal health technologies, including web-based tools and software, wearable monitoring devices, mobile phone with special software, and various analysis methods to interpret the gathered and acquired data and to provide feedback. These technologies are used along with modern psychological mini-intervention methods, such as CCBT, to help people manage stress, sleep and mental problems by encouraging them to adopt a healthier and more active lifestyle. The focus of the concept is on early prevention of or intervention on mental and health problems. The concept is based on self-management with potential expert consultation through the Internet with a low barrier for seeking information and possible treatment [15]. The devices, software, and psychophysiological theories and methods are integrated into a web portal providing a novel, coherent, and interactive Personal Health System (PHS).

This paper describes the design procedure, usage scenarios, and system requirements of the concept, and the psychological and physiological basis of the concept. Finally, we describe the

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different technological components of the concept, with early user evaluation results.

II. METHODS

A. *Design procedure, concept requirements, and usage scenarios*

In the design procedure of the P4Well concept, we used cross-disciplinary working methods to design the concept requirements, as well as to discuss the usage scenarios of the service. The design was made in a series of expert group (EG) meetings. The EG consisted of experts from participating organizations with various backgrounds, for example, in engineering, physiology, psychology, and business. The goal of the EG meetings was to develop the requirements and general description of the functions and elements of the concept (Fig. 1). The approach for the concept creation was need-driven. Our primary assumption was that the necessary PHS technologies are mainly available, but the immature applications, services and business models are the main hindrances for the wider spread of PHS.

We wanted to have efficient yet inspiring working group meetings with the experts from the different fields. To do so, we emphasized the collaborative working group methods to collect opinions from all stakeholders, and to create genuine cross-disciplinary discussions [16]-[18]. Most of the meetings lasted for a working day. During the design process, the EG met six times, with varying themes from concept general requirements to scenario building, ethical and juridical issues, functions, and related business models. The applied methods for the EG meetings worked well according to the feedback by the participants. The participants were very motivated to work at the meetings for reaching the common goal. The motivated people gave us also a good basis to introduce the new kinds of workshop methods for designing the concept with the help of the participants.

Based on the results of these EG meetings, we defined the requirements for the concept as:

- Target group: citizen between the ages 30-50 years. The concept should be suitable especially for small company employees/employers (company size less than 10 employees) and for entrepreneurs due to general lack of cost-efficient service access at present.

- Most potential scope of the concept: From primary prevention to early intervention, no diagnosis of illness required (but allowed). The emphasis must be on self-management, with potential expert consultation and support.

- Content focus: stress, recovery from stress, and mental wellbeing (including signs of mild to moderate depression). The concept should be based on valid methods only.

- Methods: the intervention and management methods include stress management and recovery strategies, physical activity, exercising, sleep, and psychological methods.

- Driving principle: the concept was defined so that an individual is seen as the best master of his/her own wellness.

Target group:
Middle-aged entrepreneur, who seeks medical help for physical symptoms and own concern.
Initiative to start using the service?
Seeks medical help due to physical symptoms and concern on life style. Occupational nurse introduces the service. Independent trial of the service through internet leads gets him to re-contact occupational health service who give detailed instruction for use of extended package with follow-up monitoring tools.
Who pays?
Part of occupational health package.
Which features are being used?
Web-based information packages (both general and more focused), questionnaires and programs
Expert consultation
Different monitor devices and their analysis SW

Figure 1: A user scenario. The figure illustrates one of the example scenarios used in the concept development phase.

- The concept must be simple and affordable, easy-to-use for diverse needs and varying levels of payment (something for free and for everybody to attract as many as possible).

- The concept should be designed for continuous and long-term use.

- The concept should foster no health terrorism, but instead life management with positive image.

- The concept should integrate the existing technologies and methods into a coherent system, which includes a web-portal, integrated measurement tools, and mobile tools.

The EG also listed and prioritised different functions of the concept. These results, among the other information related e.g. to implementation issues, were scored and re-analysed to draw a consensus on the most important functions for the concept. These requirements led to methods that we have employed in the P4Well concept. The following sections give an insight into the theoretical and technological methods and aspects for the chosen approach.

B. *Psychological Methods for Mental Wellbeing*

Computerized psychological methods have been widely utilized in health promotion interventions, targeting to various

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behavior-related problems [13]. In the P4Well concept, we have employed psychological and physiological theories and psychological mini-intervention methods to support behavioral lifestyle changes of the users of the service. The theories give the basis for the implemented computerized mini-intervention methods, as well as for the navigation logic of the implemented web-portal.

Behavioral lifestyle changes and especially their long-term maintenance are challenging for most people and require true motivation and determination. Behaviors are affected by several factors, such as thoughts and emotions, and thus merely distributing information or instructions on healthier lifestyles is usually not sufficient. Modern psychological theories provide understanding on the processes of behavior change as well as efficient methods for supporting people in making and maintaining lifestyle changes. Several theories, questionnaires, and methods have been developed to improve and learn personal mental wellbeing from theoretical standpoint.

The Transtheoretical Model (TTM) describes behavior change as a process consisting of five stages: pre-contemplation, contemplation, preparation action, maintenance, and termination [19]. In each stage, different kinds of methods are optimal in supporting the person in advancing from one stage to the next. TTM also considers relapses as a natural part of the change process, which implies that relapses and support for recovering from them needs to be taken into account in behavior change support. In the P4Well concept, we have utilized TTM for designing the navigation logic of the implemented portal. The tools in the P4Well portal are organized under five phases: information, appraisals, planning, action, and follow-up of success. The user is encouraged to follow the five phases, but he/she may start at any of these phases. Based on the user's actions, the portal guides him/her to the most appropriate tools in the same or the next phase. Currently, the implemented program cannot detect the user's stage of change, but the program is intended for managing multiple health related factors. The user may be in different stages regarding these different factors.

The CBT provides tools for supporting behavior change [20]. CBT methods help the individual to identify the problematic behavior, make small changes in them, and maintain the changes. One of the central tools is self-observation and feedback, where the individual actively observes and records his/her actions, emotions, thoughts and other health related parameters (e.g., weight, sleep habits, etc.) and based on these observations is able to learn about his/her behavior and the factors affecting it. The CBT approach gives the basis for mobile and web-based diary applications that are utilized in the P4Well concept.

Recently, a new intervention based on CBT has been presented, namely the Acceptance and Commitment Therapy (ACT). The ACT methods help in planning and boosting intrinsic motivation toward lifestyle changes [21]. One of the key methods in ACT is the value analysis. In the value analysis, the individual determines what constitutes "good life" for him/her and what actions would further promote it. This kind of individual motivational analysis is completed with individual psychological case-formulation called behavioral analysis. If

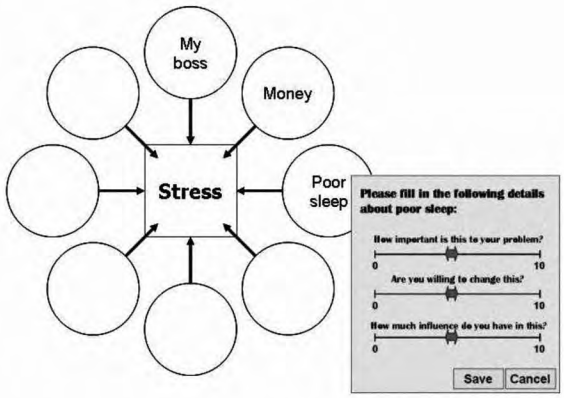

Figure 2: A schematic example of the behavioural analysis tool of the P4Well portal. The title of the analysis is shown in the center-box. Each circle includes a form for factors related to the analyzed problem. For these factors, the user can fill in the three parameters using a slider: importance, willingness to change, and possibility to influence.

the individual has an exact problem to solve, he/she may use the behavior analysis to determine what factors contribute to the problematic behavior and which of those factors he/she could change (Fig. 2).

Social atom (or social network) analysis is a method to view social relationships in terms of nodes and ties [22]. The nodes represent persons or actors within the "atoms", and the ties describe the relationships between the actors. In the analysis, there may be many kinds of ties between the nodes. The social atom method can illustrate, for example, how social problems are dealt by an individual. In its simplest form, the social atom is a map of all of the relevant ties between the nodes being studied. As a computerized application, the map can be displayed as a social atom diagram, where the nodes are represented with circles and the ties with lines (Fig. 3).

In the P4Well web-portal, we have implemented the value and behavioral analyses as well as the social atom method as computerized applications. The applications can be used at a therapy session or through the Internet with or without expert consultation. The computerized psychological methods and analyses of the portal can be used along with personal measurement devices, providing quantitative physiological feedback for recovery.

C. Physiological Aspect of Stress and Recovery

The P4Well concept aims to provide reliable information and feedback concerning especially stress, recovery, sleep, and exercise, therefore supporting the user's learning process and self-management. In addition to psychological methods, an essential part of the concept is to offer users up-to-date methods and technologies to objectively measure the effects of their lifestyle and habits on their physiological reactions and wellbeing.

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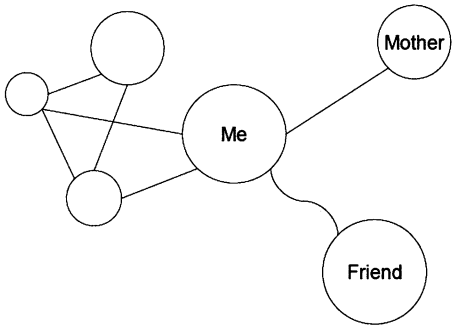

Figure 3: An example of a social atom diagram. The circles represent individuals and the lines their connections. The size of the circles as well as the type of the lines can vary with different relationships.

A simplified definition of stress refers to a situation where perceived mental strain exceeds a person's coping capability. Physiologically, stress refers to a chain of events where stressors that are threatening to an individual elicit physiological responses (Fig. 4, [23]). One of the main physiological regulation systems that is responsible for these stress reactions is the autonomic nervous system, ANS [24]. Rapid physiological stress reactions are necessary for successful coping with a stressor, but if the stress continues, they may have long-term negative effects on health [9]. Recovery from stress, in turn, is a process during which individual functional systems that have been called upon during a stressful experience return to their pre-stressor level [9], [10].

For both stress and recovery from stress, it is necessary to have reliable measurements. Some general aspects must be taken into account when the measurements are performed. Firstly, it must be noticed that stress can be either positive (eustress) or negative (distress). Secondly, individual resources influence both experiences of stress and recovery, as well as physiological reactions to them. Also, both subjective and objective (physiological) measurements should be used. Although self-reports have been used widely to detect both stress and recovery, it is not always enough: subjective experience of reduced stress might not necessarily mean physiological recovery from stress [25]. Besides, other stress sources must be kept in mind, although work stress or job strain seems to be the most investigated area in the field of stress research. When health is in focus, stress has harmful effects, regardless of whether its roots are in work, family, or leisure time. Therefore, all of these aspects must be taken into account. As indicated earlier, it is not stress per se that is harmful, but what is essential is whether recovery from the stress succeeds during relaxation periods; that is, rest, sleep, and days-off, and whether there is sufficient amount of such periods for recovery.

In the P4Well concept, we apply wearable devices for measuring of the activity of the ANS. The ANS function and the balance between activation of ANS subdivisions, sympathetic and parasympathetic system, can be objectively examined via analysis of heart rate (HR) and heart rate variability (HRV) [26]. Generally, sympathetic dominance is an indicator of physiological stress, whereas parasympathetic, that is, vagal dominance, indicates recovery from stress [24]. When HR and HRV are used to reflect ANS balance, high HR and low HRV indicate sympathetic dominance, while low HR and high HRV indicate parasympathetic dominance.

Sleep is the most important time period for recovery of an individual, and it should also be characterized by vagal dominance of the ANS. A good night's sleep is continuous and long enough [27]. Disturbed sleep and sleep loss have been linked to adverse physiological and psychological effects, and when prolonged, to diseases such as type 2 diabetes and cardiovascular diseases [28]. In P4Well concept, we use wrist actigraphy for objective monitoring of sleep quality and quantity [29], giving a good idea of the amount of sleep

A large body of evidence suggests that exercise and physical activity are beneficial for various physiological and psychological outcomes [11]. The positive effects of exercise include improved general health, better functional capacity and reduced morbidity and mortality. Physically active lifestyle supports psychophysiological wellbeing, promotes sleeping, and improves quality of life [11] [30]. One important goal of the P4Well concept is to support and encourage the users' participation on physical activities and active lifestyle, and to provide guidance for appropriate exercising habits where technologies and devices have a central role.

D. P4Well Technologies

The P4Well concept integrates different personal health technologies, such as mobile phone wellness applications, heart rate monitors, actigraphs, and other wearable and ambient devices (such as scale, pedometer, heart rate belt, etc.). The concept also involves different computer programs and mobile applications for analysis of stress and recovery from stress.

The P4Well web portal is being implemented on the **Mawell S7** platform (Mawell Ltd., Oulu, Finland, http://www.mawell.com/solutions/S7/). The web portal serves as a centralized information and data center. The portal includes information content, questionnaires, expert consultation, social atom analysis, value analysis, behavioral analysis, social media (interactive communication between the users), and news. Also, the portal integrates all the P4Well technologies into a coherent system.

Nokia Wellness Diary (WD) (Nokia Corp., Espoo, Finland, http://research.nokia.com/research/projects/WellnessDiary/) is a mobile phone application and it is used to record and monitor daily self-assessments and measurements, either for physiological or psychological factors, e.g. eating habits, steps, blood pressure, weight, stress level, sleep quality and quantity, and many others. Nokia WD is a personal mobile device application, thus ensuring the user's privacy and ease of use in everyday contexts. **Nokia Wellness Diary Connected (WDC)** (Nokia Corp.) is a web-based calendar-like application for storing and analyzing wellness related data. WDC is the Internet version of Nokia Wellness Diary mobile application and contains the same functionalities. Wellness data can be synchronized with WDC server or shared with a wellness professional. Synchronization is initiated by the user by using

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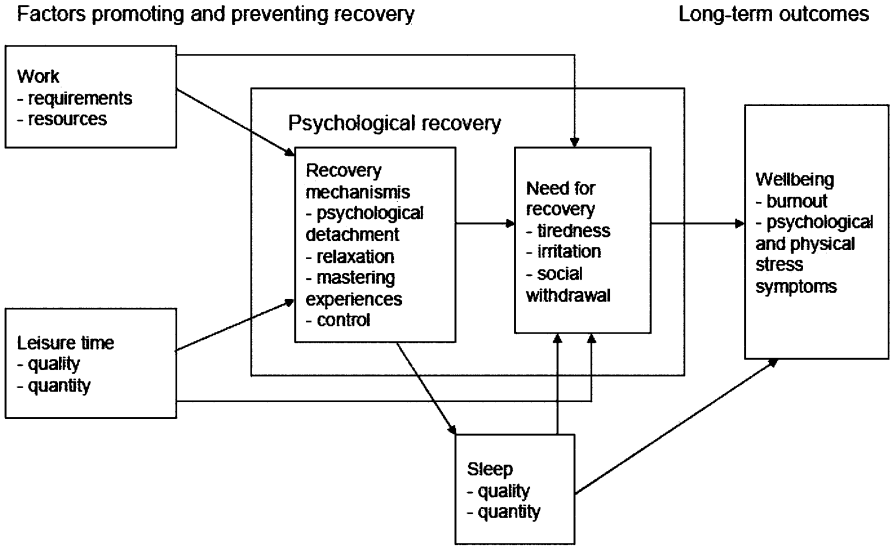

Figure 4: A recovery model illustrates the different factors related to psychological recovery [23].

mobile WD. Use of WD and WDC in the P4Well concept is based on the CBT approach. The mobile applications give tools for self-observation and feedback, supporting lifestyle change.

Firstbeat Mobile Coach is a mobile phone application and **Firstbeat Webtrainer** (Firstbeat Technologies Ltd., Jyväskylä, Finland, http://www.firstbeattechnologies.com) is its web-counterpart which may be used to create a personal exercise plan. The applications are based on exercise training recommendations [31] and adapt to deviations from the plan as well. Webtrainer and Mobile Coach sum up workouts of different disciplines to a same scale, Training Effect [32] enables that users can be prescribed a certain training load, lower for less fit and higher for more fit. The user can chose if he/she wants to use HR monitor or accelerometry with the applications. However, it is required to know the duration and the intensity of the workout. The training program, designed to meet his/her fitness level and goals, motivates and guides the user towards independent and regular health and fitness promoting physical activity. The software evaluates and monitors the user's fitness development. The application advises the user towards efficient workouts, utilizing a training effect scale of 1.0 - 5.0. Firstbeat Webtrainer can summarize and report the user's exercise data also to a wellness professional for communication and feedback. The training application enables personal guidance for those who require it. In the P4Well concept, the training software applications (Mobile Coach and Webtrainer) support and encourage the users' participation on physical activities and more active lifestyle. Also, the applications provide guidance for appropriate exercising habits.

Vivago Personal Wellness Manager (PWM) (Vivago Ltd., Helsinki, Finland) is an actigraph, which continuously measures the user's activity from the wrist. Based on the activity measurements, the amount of sleep and its development can be analyzed. **Vivago Pro** (Vivago Ltd.) analysis program is used for viewing and analyzing long-term activity data and creating feedback reports. In P4Well, Vivago is used to get objective assessment of sleep quality and quantity at home, identifying possible sleep problems and monitoring effects of any interventions on sleep, and also giving an estimation of sufficiency of sleep time to allow sufficient recovery period from stress.

Suunto heart rate monitors (HRMs) (Suunto Ltd., Vantaa, Finland) measure heart rate changes, and keeps track of the highest, lowest, and average heart rate during training. The user can program the heart rate monitors with upper and lower heart rate limits, and be alerted if the heart rate is not inside the range. The heart rate monitors help the user maximize the results of training. In P4Well, exercising plays important role due to its proven effects on stress management, sleep improvements, and depression treatment. HRMs may be used to e.g. to guide inexperienced trainers in dosing of exercising to optimal levels.

Suunto Memory Belt (Suunto Ltd.) s a heart rate recorder belt with integrated memory, and thus does not require the usage of a wrist unit. The Memory Belt can be used for recording heart rate variability data for more than 24 hours. The recorded data can be downloaded to **Suunto Training Manager** (Suunto Ltd.) or Firstbeat HEALTH computer program for further analysis of the heart rate variation.

Firstbeat Bodyguard (Firstbeat Technologies Ltd.) can be used to record heartbeat data continuously for 3-5 days. The small device is able to store the data with a high sampling rate. The rechargeable battery of the device lasts for three days of active recording. The recorded data can be downloaded with a docking station to Firstbeat HEALTH software for analysis.

Firstbeat HEALTH (Firstbeat Technologies Ltd.) is a non-clinical computer software application designed for health care professionals and researchers. It detects exercise, stress and

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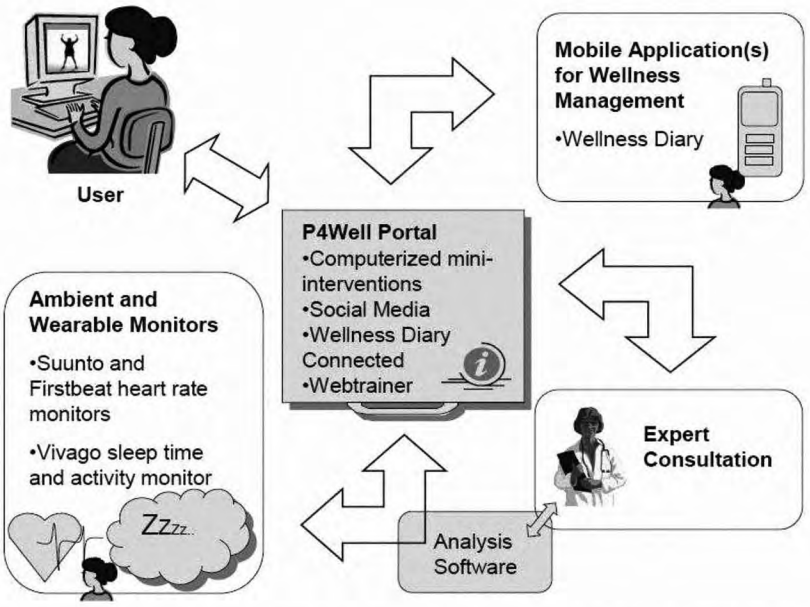

Figure 5: A schematic illustration of the P4Well system. The system includes ambient and wearable monitors, mobile applications, analysis software, potential expert consultation, and the P4Well portal with the computerized mini-intervention methods. All the devices and software are available for independent usage; the user can choose the most convenient approach to him/herself for wellness management. The arrows represent the information and data flows of the service.

recovery dynamics using both HR, HRV and respiration rate calculated from ambulatory R-to-R interval data using the short-time Fourier Transform method and neural network modeling of data [33]. The software program has been shown to detect physical activity and relaxation periods during rehabilitation and relaxation courses [34], and respiration rate, oxygen consumption and energy expenditure reliably during simulated and real life exercises and tasks [35]. The software first calculates the physical activity (= exercise) and then stress and recovery dynamics and consequently there can not be stress or recovery state when physical activity is detected. The determination of stress and relaxation states is based on the detection of sympathovagal reactivity that exceeds momentary metabolic requirements for the autonomic nervous system. The stress state is defined as increased activation in the body, induced by external and internal stress factors (stressors), during which sympathetic nervous system activity is dominating and parasympathetic (vagal) activation is decreased. The body is in a stress state when HR is elevated, HRV is reduced, there are inconsistencies in the frequency distribution of HRV, and respiration rate is low relative to HR and HRV. Previously, the changes in self-reported mental strain have been shown to correlate with the corresponding changes in physiological stress and relaxation detected by Firstbeat HEALTH [33]. In addition, stress and relaxation during sleep has been shown to correlate with free salivary cortisol after awakening. In P4Well, Firstbeat HEALTH can analyze heart rate variability data acquired with Bodyguard, Memory Belt, or Suunto t6 heart rate monitors. The software supports assessment of several well-being related issues, such as physical workload, daily stress and recovery, health promoting effects of physical activity, effectiveness of fitness training, energy expenditure, and weight management. Various feedback reports can be generated with the program. The feedback reports, which can be delivered through the P4Well portal, give indication of the ability to recover and reveal a potential decrease or increase in resources during the day.

E. The P4Well Portal

We have integrated the described state-of-the-art technologies, modern psychological theories, mini-interventions, and physiological knowledge into the P4Well web-portal. To the users, the portal offers a modern easy-to-access service for empowering their self-management of psychophysiological wellbeing and load recovery. The portal forms a coherent and interactive personal health system (Fig. 5). The mobile tools, such as Wellness Diary, may directly synchronize their data with the portal (WDC), while the data from the measurement devices are stored to the portal for user to access in forms of reports from corresponding analysis software. These reports may then be shared for expert consultation, or viewed for long-term follow-up.

The P4Well concept relies on toolbox-thinking, that is, the goal is to offer in parallel several different devices and methods with the psychophysiological knowledge and information. This means that there should be something interesting to offer for everybody, yet nobody is assumed to use all the devices or methods of the service simultaneously. Also, it is important that the concept can offer different options for a need, and gives a chance to change the tool or method during its use.

The portal provides a low barrier for seeking help and trusted information from health experts delivered through the Internet by secured private communication channel. The social media

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and peer-support for sharing and discussing information among the other users play an important role in the service as well.

III. Preliminary Evaluation

The P4Well concept consists of different technologies and psychological approaches. These distinct parts have been tested in clinical practice or verified scientifically (e.g. [36]). The CBT-based psychological components used in the concept have been also evaluated in clinical studies/practice (e.g. [37]).

The service concept as a whole was evaluated and co-designed with potential users in several user sessions between June and November 2008. These evaluations suggested that there would be a well-grounded need for this kind of service concept in Finland. The co-design of the concept continues through the P4Well project over the years 2008 and 2009. Currently, an actual user study with 12 middle-aged men is under way. The preliminary results of this study indicate that the participants have started to use the provided technologies. Furthermore, the concept seems to be well-accepted by them. A group of 24 entrepreneurs will participate in the evaluation study of the concept starting in the spring 2009 as well. Results of these ongoing studies will be reported elsewhere later on.

IV. Discussion

Previously reported studies have demonstrated the usefulness of the CCBT methods [13]. In the P4Well concept, we have utilized the computerized psychological and physiological methods with the mobile phone applications and the different measurement devices. Especially, the mobile applications along with the CCBT methods provide a novel perspective to wellness management. This kind of approach gives an opportunity to personal introspection everywhere, regardless of time and space. Moreover, we want to emphasize that the measurement devices combined with the physiological knowledge can provide objective and quantitative feedback to the user, which is important especially in case of potential treatment. The acquired information can be utilized (with the user's permission), for example, in occupational health care.

Several ethical and juridical issues are dependent on whether the service is considered as a wellness service or health service. Currently, the P4Well service concept is considered as a wellness service, but this may depend eventually on the potential service provider and related business model. The content and its management must be designed carefully in the concept. The brand and promise that the service gives were considered as central issues; these must be valid and ethical. Besides, the information and data provided by the user for the service are always handled as they were with user identification, and cannot be accessed outside without the user's permission.

Potential business models and value networks of different stakeholders of the concept were analyzed during the development work. In the long run, a well-designed business model would be vital for commercialization of the P4Well concept (which is currently in research phase). There are several questions related to the business model to be solved: (1) who is the customer of the concept, (2) who pays and to whom, (3) who provides the service, (4) which kinds of relationships exist between the different actors participating in the service orchestration, (5) who are the beneficiaries, and (6) how does the money and value flow between the stakeholders. These challenges of complex earning logic, complex dependability on several stakeholders, and immature market, probably are slowing the successful introduction of the integrated PHS solutions to the market. Still, different and novel options for earning logic exist and can be found, depending on who is the primary customer. Most popular candidate for the primary customer in short term would be occupational health service provider; this is due to realistic earning model within current operational and legal framework. The roles of the technology providers and the pension insurance companies (who have the main role to promote the service through funding model, and return of investment through savings in pensions and illness leaves) were mostly similar in all analyses. One important challenge is to make the concept generic enough so that it can be easily adapted by many organizations to their models of care. This requires flexibility and efficient package for training the care providers, consultants, or personal trainers supporting the user.

In the proposed concept, we have applied the specific advanced technologies provided by the partner companies. However, it is important to recognize the ideology of the concept, that is, the CCBT techniques, physiological knowledge, and the mobile applications integrated with the web-portal provide the core structure for the concept. In addition to the devices we have applied, any other similar devices and software could be exploited in the concept for personal wellness management.

V. Conclusion

We have proposed the novel service concept to empower self-management of psychophysiological wellbeing, management of stress and recovery from stress. In the proposed concept, the modern computerized cognitive-behavior therapy methods are combined with the advanced mobile and web-based applications providing a novel, coherent, and interactive personal health system. Moreover, the psychological and physiological knowledge embedded into the system is utilized with the electronic measurement devices that can provide quantitative information on the personal wellbeing. Currently, more thorough investigations on user experiences as well as on the therapeutic use of the system are in progress. The results of these studies will be reported in the near future.

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