An Overall Health and Well-Being Data Model for Employer-Sponsored Personal Health Records

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ABSTRACT

With the need for employee-directed health management in organisations, employers have started to utilise personal health records' (PHRs) potential to shift health management responsibility to employees. Whilst the overall well-being of employees in organisations has become the trend in wellness activities at work, existing literature has paid less attention to identifying proper data organisation and management in employer-sponsored personal health records (ESPHRs) for overall health and well-being management of employees. We conducted three focus group discussions with 26 participants comprised of employees and employers to identify information concerns in occupational health and well-being management. We found that health and well-being data can be organised into six main domains when considering the overall health and well-being of employees. Consequently, a survey was conducted among 360 respondents to identify employees' and employers' perception of the usefulness of having overall health and well-being information in ESPHRs. We found that both parties accept the importance of all health and well-being information domains in ESPHRs. However, employees believe there is more usefulness in having physical health and healthy behaviour information in ESPHRs, while employers see the importance of work environment, emotional health, basic access and life evaluation information as more useful to have in ESPHRs. Information concerns identified through a thematic analysis were then used to develop an overall health and well-being data model for ESPHRs. These findings suggest that a new data organisation in ESPHRs when profiling employee health and well-being data has a high chance of achieving effective ESPHR system use in organisations.

CCS CONCEPTS

• **Applied computing → Consumer health**; *Health informatics*; Health care information systems;

KEYWORDS

Personal health record (PHR), Employer-sponsored PHR (ESPHR), Employee health and well-being, Data modelling

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1 INTRODUCTION

Existing ESPHR systems carry the concept that providing more information will improve employees' own health management [17]. However, all those systems focus on traditional occupational health management. They are mostly limited to personal medical and health information giving less attention to organisational and social factors that influence overall health and well-being of employees and their outcomes [20]. The health of an employee is not limited to physical and mental health [50]. Social well-being resulting from work-related and non-work related organisational and social factors may interfere with their behaviour as well as performance [14].

In healthcare practice, an improvement in self-health management behaviour follows an increment in patient activation [26]. The necessary intervention and method needed to increase patient activation through PHR systems is still a challenge while it has been proved that the effectiveness of a PHR system is not dependent only on the complexity or advancement of the technological tool, but also the tool's user-friendliness, design for ease of use, and documentation in an organized manner, with the capability to collect, track and share health information [59].

Increasingly, occupational health is now reaching areas such as employee assistance programs (EAP) and counselling which are generally not considered as related to occupational health in traditional human resource concepts [27]. On the other hand, the concept of positive activities has proved that the well-being of people is under the control of healthy thoughts and behaviours [38]. Supporting the trend, information systems design and human computer interface research is also moving into the area of personal well-being, which was almost forgotten in the past decade [41].

The major aims of ESPHR adoption are to mitigate the health risks and conditions disturbing organisations and to upgrade the health and well-being of the total employee population. The provider's objectives are to go beyond the main purpose, yet they expect to see related productivity improvement to justify their return

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on investment (ROI). Contemporary electronic health record systems such as electronic patient record systems are now using their databases and associated health surveillance analysis to identify health risks before they reach an uncontrollable stage [52]. This has an even greater advantage in ESPHR systems to identify health risks of the workforce before they appear and even before they influence the productivity of the organisation. Thus, employers serving as a business associate can share information directly with employees with a common understanding that ESPHRs are for the betterment of the employee [22].

Due to changing lifestyle patterns, demographic developments and the prevalence of non-communicable diseases (NCDs), publicly available health issues have entered into organisations [4]. Therefore to face the competition in modern organisational environments the needs of a healthy workforce are more essential than ever before [61]. Though computer-based tools and applications such as ESPHR systems are available in organisations, employees' motivation to use those applications to engage with their own health and well-being is of paramount importance. Consequently, organisations currently using ESPHR systems as well as organisations that have prospects to use one in the future are keen to understand ways of improving employee engagement in health and well-being through ESPHR systems. Therefore in this study we:

- Identify the most useful information content in ESPHRs, that represents the overall health and well-being of employees; and
- Identify categories of health and well-being information employees and employers believed to be useful for overall health and well-being management using ESPHRs.

This paper is organised in five sections including the introduction section. The second section explains the background of the issue in focus. The third section explains the methodology which we have followed in achieving the results. The fourth section discusses the findings and the final section concludes the study explaining the significant outcomes of the study.

2 BACKGROUND

Compared to the previous decade, in the last few years, the health and well-being of employees is increasingly identified as important for organisations. The World Health Organization (WHO) also stated that the most successful and competitive organisations are those that have the most physically and mentally satisfied workers [61]. Consequently, employers' interest in improving employee health and well-being as an organisational strategy has been rising higher than ever before [46]. A survey on emerging trends in healthcare strategies of employers revealed that the current focus is on four main areas namely, managing cost, adding value, increasing employee engagement and exploring new options to uplift health and well-being of total employee population [55].

The constitution of the WHO defined the concept of general health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [60]. However, Huber et al. criticised the word 'complete' in the definition as a difficult concept to operationalise and measure, and thus proposed the concept as "health as the ability to adapt and self-manage" [28]. Accordingly, proposed aspects such as functioning, disability and perceived quality of life and well-being which are measures of individual health align with WHO definitions. For example, health-related quality of life (HRQL), which is referred to as "an individual's perceived physical and mental health over time", is used extensively by clinicians as well as researchers to measure health status and is added to well-being factors for a holistic picture of an individual's health [43]. A framework of health systems published by the Australian Institute of Health and Welfare aligning with WHO standards highlighted the determinants of individual health and well-being as biomedical and genetic factors, health behaviours, socioeconomic factors and environmental factors [40]. The health measuring tool developed by Dartmouth Cooperative Group (COOP) and the World Organization of Family Doctors (Wonca), assessing physical functionality, feelings, daily activities, social activities, pain and overall health, showed them to be good measures of general health [28].

In light of Conative Theories, well-being is generally viewed in the form of desire-satisfactionism or aim-achievementism, seeing well-being as a psychological status that is influenced by others or a state decided on by an individual's own concerns [47]. Different meanings under well-being became unified by the term 'self-fulfilment' suggested by Daniel Haybron [24]. He combined three main aspects of well-being, namely physical health or vitality, subjective meaningfulness of life (success), and fulfilment of emotions (happiness) under the concept of self-fulfilment. Giving a different interpretation to well-being, Kraut in 2007 defined the theory of 'developmentalism', which is involved with activities that flourish on cognitive, social, affective and physical skills, as good for a person. Two overlapping philosophies, namely hedonism and eudaimonism, govern the concept of well-being. The hedonic view suggests well-being is happiness or pleasure while the eudaimonic view goes beyond happiness and identifies well-being as actualization of one's potential [49]. However, in measuring self-reported well-being the subjective well-being based on the assumption that "peoples experience of a set of circumstances is as important as the circumstances themselves, and the people are the best judges of how their lives are going" is considered as the most reliable measure [18].

Employee health and well-being is considered as a combination of the physical, emotional, mental and social health of an employee that is also affected by the workplace environment [50]. Moreover, workplace health management practices identified the health of employees as a summative result of individual behaviour and the work environment [37]. Therefore, employee health promotions in organisations are not only creating suitable work environments but also strengthening personal health practices through various health promotion programs [16, 37]. Many organisations around the world provide employee health and well-being facilities through three main health management systems, namely Occupational Health and Safety (OHS), Workplace Health Promotions (WHP), and health and ill-health management (Employee Assistance Programs (EAP), absence management and return to work programmes) [42]. Juniper et al. [30] defined work-related well-being (WRWB) as " ... that part of an employee's overall well-being which is determined primarily by work and which can be influenced by work-place interventions".

Employer-sponsored wellness management programs that focus only on the physical health of employees have increasingly been directed towards employees' overall well-being management [44]. As a result, various dimensions of employees' lives including their physical, emotional, financial and social well-being and healthy behaviours have been considered by researchers in defining the overall well-being of employees [37, 50]. Additionally, an organisational climate which is shaped by factors such as working conditions, employer respect and trust, learning opportunities and workload also have been identified as associated with employee health and outcomes [29].

Danna and Griffin in 1999 conceptualise health and well-being at the workplace as a multidimensional concept which combines general health, life experiences, and job-related experiences added to facet-specific factors. They suggest that health and well-being in the workplace are usually influenced by antecedents such as the work setting, personality traits and occupational stresses. From a broader perspective of well-being at work, the general health of an employee is identified as a subset of employee well-being. Thus, mere consideration of employee health is insufficient for the view of the well-being of a 'whole person' at work [58]. The well-being which employees experience at work is influenced by both work and non-work activities. Therefore in such a context, factors such as life satisfaction, happiness (life experience dimensions), context related factors such as job satisfaction, job attachment (job experience dimensions) and factors such as satisfaction with co-workers and remuneration (facet-specific dimensions) are suggested as consideration in well-being at work [14]. From a different perspective, Fisher's conceptualisation of overall well-being at work combines social well-being, eudaimonic well-being and subjective well-being.

The interaction between work and employee health has been discussed vastly in occupational health and well-being. Where employee health impacts on their work, the work environment also bears an impact on employee health. The organisational culture that can support the psychological needs of employees has a significant influence on employee well-being at work [21]. Dickson-Swift et al. [16] have claimed that creating a supportive work environment through respectful personal relationships, flexible work, supportive management and good communication has significant impacts on employee overall well-being.

Organisations' efforts to create a safe and healthy work environment may provide a climate of trust, which in turn encourages employee commitment to achieving organisational goals and plans that lead to employee empowerment [13]. Supporting this idea, recent reviews indicated that WHP interventions significantly contribute to enhancing employee health [16, 37]. However, without the employee willingly being involved in their health management, health benefit programs produce little success. Organisations have identified that the empowerment and health engagement of employees is a must to reach success in their health management strategies [45].

A large survey conducted on US employees by Barron in 2013 showed that the top health risk factors which affect employees are weight, diet, blood pressure, stress and inactivity. In addition, the 2010 World Economic Forum highlighted eight health risks to be managed including behaviours of poor diet, physical inactivity, smoking, lack of health screening, insufficient sleep, poor standard of care, excessive alcohol consumption and poor stress management which drive the fifteen most influential chronic conditions in the world [62]. Those chronic conditions have the ability to degrade employees' performance and generate costs to the organisations.

According to the broader view of health and well-being, health is only a part of the equation which influences employee behaviour and the organisation [14]. A well-known research organisation named 'Buck Consultants', through an extensive survey in 2014 on health and wellness strategies of more than 1000 employers all around the world, concluded that employer-sponsored health and well-being strategies are increasingly focused on an integrated approach to support the overall well-being of employees, supporting not only their health but also their wealth and career [8]. They proposed a consumerism 360 degrees framework that invites both employers and employees to take shared responsibility to achieve mutual goals. This concept identified the need of a middle ground in between the extremes of paternalism (organisations take the full responsibility of all aspects of employee security needs) and consumerism (employee as a free agent who takes care of their own health and career development) in supporting employees' health and well-being at the workplace.

Advancement of information technology is empowering patients to shift themselves from doctor-centric to patient-centric systems and use information technology for wellness promotion [33]. Mobile based applications such as 'BeWell+' which have been developed as community guiding and well-being persuading tools are popularising among the health conscious public [36]. Similarly, PHRs as an emerging technology to manage personal health related information create a good ground for patient empowerment through features and functions. Functionalities that provide the ability and responsibility to manage patients' own health affairs make patients empowered to engage with self-health management [25].

An analysis of free web based PHRs predicts that empowering could be made possible by providing functions with explanatory text that supports users [19]. The encouragement of individual behavioural change through knowledge sharing, education and helping users understand their condition, particularly for chronic illness management, is effectively applied with the support of web-based systems [57]. These patient portals are secure Internet-based platforms that offer patients the ability to view their personal health information (PHI) and facilitate two way secure messaging between patients and healthcare providers. Such portals are also equipped with functions to schedule medical appointments and request prescription refills [23]. For example, in the United States of America, an electronic patient-centred healthcare system project initiated by the Office of the National Coordinator in various states across the country, which facilitated patients to have access to their health information (using PHRs), resulted in changes in the attitude of patients and care providers, whereby patients themselves became more aware and engaged in the management of their health [48]. Thus PHRs proved to play a major role in user engagement with proper education of their rights in information management [10].

Engagement of employees in their health and well-being is the main expectation of ESPHR systems [9]. The effectiveness of ESPHR systems relies on the better identification of the values of stakeholders and activation of employees in the employer-employee relationship [1]. The latest occupational wellness programs throughout

the world are designed to improve overall health and well-being of employees, focusing on intrinsic motivators, and personal engagement methods supported by Information Technology (IT) [8]. However, the ability of existing ESPHR systems design to align with those wellness trends through the relationship of employees and employers has not been examined in the previous literature.

3 RESEARCH METHODOLOGY

We conducted this study as a part of a large project that focuses on employees' perceptions to engage in computer-based occupational health and well-being information management. This study comprises two parts. Firstly a qualitative study using focus groups and then a quantitative study using a questionnaire survey. We used this mixed method sequential research approach following the methodology explained by Creswell and Plano Clark [12] to explore this new research area. Both qualitative and quantitative studies were conducted under the ethical approval granted from the human ethics committees of the Queensland University of Technology, Australia and University of Colombo, Sri Lanka.

3.1 Qualitative Study

Use of qualitative data in human-related research is growing in popularity for its ability to produce an in-depth picture of a complex social phenomenon [11]. Previous research has claimed that personal health information management (PHIM) is a complex undertaking due to the interaction of various characteristics, information and the needs of stakeholders [7]. Studies on PHIM applications such as PHR systems suggested using different qualitative data collection approaches including focus groups, interviews and observations [2]. Prior research studies on PHR systems have used interviews as a user-centered exploratory approach at the beginning of the study, to uncover user attitudes before going into quantitative data [34]. Similarly, focus groups have been used in previous research as a method of obtaining various user views, opinions about introduction of new technologies, and gaining insight into complex problems in health research [39]. PHR systems research and particularly ESPHR systems research have highlighted the importance of the system provider for the effectiveness of the system [1, 9]. In ESPHR systems, both employees' and employers' expectations of ESPHR systems are different, yet join into a common track when it comes to the improvement of employee health and well-being [56]. Communication between employees and employers about their organisation's needs of health and well-being with an understanding of benefit expectations of both parties is essential for the better adoption of ESPHR systems [1]. Therefore in our research, we have used focus groups to combine and include both employees and employers in a structured setting for a discussion of their health and well-being related information needs and ideas about ESPHR systems. The expectation was to create a discussion between both parties about their information needs in health and well-being which is not possible in individual interviews. Consequently, we selected employees and employers from different organisations to participate in focus groups. We ensured that employers and their employees from the same organisation were not included in the same focus group. This was to allow the participants to freely express their divergent opinions. Furthermore, the moderator created an environment allowing participants to question other's opinions, whereby participants were in a climate which avoided the convergence of views.

3.1.1 ***Focus Group Participants.*** Office-based employees and employers are our target population. Our selection of office-based workers for this research study is backed by several reasons. Compared to other categories of workers, they are technology-friendly people who can be easily approached to participate in an application such as ESPHR systems in work and non-work environments. Additionally, in the selected context, these categories of workers have a high prevalence of non-communicable diseases (NCDs) compared to other categories of workers due to their long work hours, performing a desk-based job in an office [15]. Most importantly, managing the health and well-being of office-based workers is accepted as a self-responsibility of the worker. Comparatively, other categories of workers such as factory workers or people working in agriculture or defense already closely monitor their health as a part of their profession [31].

Participant selection for the focus groups was carried out in two steps to improve the representation and minimise possible biases. An open invitation explaining the objectives of the study was posted to a forum where different levels of office-based employees have accessibility. From the people who replied to the invitation, participants were identified covering both employees and employers working in office-based environments. We identified "employers" as the people who represent the corporate management level, i.e., the employee's financial employer or the employer's representative in the form of the employee's line manager. Accordingly we selected 14 (54%) employees and 12 (46%) employers for our focus groups. Participants were selected from both genders, and different age groups to overcome any potential biases. The participants were computer literate and have completed secondary or tertiary education, were thus capable of providing knowledgeable inputs to the discussion. The participants for this research study were selected from Sri Lanka due to the researchers' accessibility to appropriate individuals and resources.

3.1.2 ***Procedures Used in Focus Groups.*** The aim of conducting focus groups was to learn from people who are working in real working environments. The objective was to identify their health and well-being related information needs and perceptions in relation to managing personal health information with the support of their employer. Therefore, we took actions to educate the participants prior to the discussion. An email explaining the main questions that are taken into the discussion was sent to each participant once they accepted the invitation to participate in the study.

There were three focus groups conducted over a period of two months. In total, 26 participants participated in the focus groups. Each group consisted of both employees and employers. We considered views of corporate level managers to identify employer perspectives on employee health and well-being. Participants were selected from different organisations, thus discussion was open and contradictory ideas on responsibilities were discussed freely. The main objective of this discussion was not to assess any health-related data relevant to participants but to identify different information needs of employees and employers in relation to health and well-being in an organisational context. We have followed similar approaches which were used by previous researchers in

administrating focus groups [32]. The focus groups discussion was moderated by the principal investigator with the support of an assistant. The assistant's role was to name the participant (using a code to de-identify participants) and take down the participants' code and the first few words which were spoken by the participant each time the participants were involved with the discussion. The assistant's report was used to relate ideas to the process of data analysis and interpretation. The participants were given an information sheet before starting the focus group discussion. The total discussion was audio recorded with the permission of participants by signing a consent form prior to the discussion.

3.1.3 ***Focus Group Data Analysis.*** A thematic analysis of the data was conducted following the steps explained by Braun and Clarke, to derive the main themes that emerged from the dataset. Thematic analysis is identified as a well-accepted and widely used method in health and well-being research [6]. The thematic analysis process consists of six steps, namely familiarizing with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes and finally producing the report [5]. The process was conducted separately by two investigators and compare the outcomes to minimize the individual biasses.

Initially, we listened to the recording to immerse ourselves in the data and to familiarise ourselves with the depth and breadth of the content. Each focus group's audio recording was between 45 minutes to 60 minutes in length. The surrounding sounds and the different voice levels of participants were the main difficulties that we encountered as a disturbance to the clarity of the audio recording. Since the principal investigator actively involved himself with data collection, transcribing and proofreading, we managed to overcome the issues related to voice clarity and interpreting accurate meanings. The audio recordings were transcribed with the support of an assistant and the transcribed data were re-checked for their accuracy by listening to the audio recordings repeatedly and comparing the transcribed notes by the principal investigator. This process, on the one hand, helped us to familiarise ourselves with the data in the transcribed notes and on the other hand to improve the reliability and validity of the data. Additionally, we took notes of the ideas that emerged from the data that we used for coding in the following step.

In the second step, we gathered all the data from three focus groups together into one text document using Microsoft Word (Version 2016). The document was labelled with participants code names and the ideas expressed by each participant in text formation. The participant code name was developed to identify the participant category ("E" for employee and "R" for the employer), the gender ("M" for male and "F" for female) and a number to identify the participant's representation in focus groups. For example, a male participant represented the employer category who joined first to the focus group discussions got "ER1" as his code name. The questions raised by the principal investigator as the moderator, the participant's code name and the ideas they expressed were formatted for ease of analysis. The text relevant to an idea expressed by participants formated as normal text style while questions and the participant's code name who answered the question formated as heading 1 and heading 2 style respectively.

Next, we approached the data with our first objective in mind (Identify information concerns in regards to workplace-based overall health and well-being of employees). Therefore, the coding process was more deductive in nature [5]. In the beginning, we grouped the data extracts manually to initial codes identified from the data. However, for a systematic grouping process, we considered employee and employer views separately in the light of existing terms in health and well-being relevant to employees. Accordingly, initial code names (rubrics) were developed for employee related information considering the existing factors and determinants of health and well-being. We developed a table using Microsoft Excel (Version 2016) by taking the columns of participants' code names and rows as health and well-being related codes identified previously. The cells in the table were filled with the data extracts according to the relevance we identified in the ideas expressed by each participant.

In the third step, the initial codes identified previously were combined together to develop broader themes. The employees' concerns of health and well-being were linked with their physiological and psychological health, health-related habits and behaviours, their work environment-related health issues, and their well-being as a whole. Due to the fact that this information aligned with the overall health and well-being factors introduced in Gallup-Healthways well-being index (WBI) [18, 51], we combined the employee health and well-being concerns into six themes, namely physical health, emotional health, healthy behaviours, work environment, basic access (attainment of their basic health, financial and community requirements) and overall satisfaction. Reviewing and naming the identified themes were the fourth and fifth steps of the thematic analysis process. Based on the analysis results of two investigators, an inter-rater reliability was assessed using Cohen's kappa coefficient method and found a strong level of agreement between two raters (k= 0.878).

3.2 Quantitative Study

After the focus groups, we administrated a single-stage questionnaire survey. The questionnaire contains a question focused on the features of a prospective ESPHR system that are useful for users to manage their health and well-being information. The questionnaire begins with a description explaining the ESPHR system model that gives total information control to the employee and the ability to share information with their employer based on employee preferences. Respondents were asked to rate their preference in the usefulness of 15 features that were identified through literature surveys and features related to themes discovered through our focus group discussions (listed in Figure 1). We used a seven-point Likert Scale.

3.2.1 ***Survey Respondents.*** The survey was conducted among office-based employees in Si Lanka. Office-based employees are a group of employees that have a high prevalence of most common chronic illness in Sri Lanka [15]. For that reason, there is a high interest in health and well-being among employers and employees working in office-based work environments. For our questionnaire survey, banking and finance sector employees were selected as a focus population. The banking industry was selected due to two reasons. First and most important is that this information technology friendly environment is typical of those in the service sector

that has the greater potential to implement ESPHR systems. Second is to avoid any confusion of health-related results that may arise in hazardous or stressful environments in other industries involving manual labour or physical risks. Four hundred and fifty banking and finance sector employees from both state and private banks in Sri Lanka were invited through an open invitation to participate in an anonymous questionnaire survey. We obtained valid responses from 360 respondents that represent all three levels of employees. Therefore the responses are from 22 senior managers (6%), 144 middle level managers (40%), and 193 operational level managers (54%). Selection of respondents for the survey was purely dependent on their willingness to participate and the availability of resources.

3.2.2 ***Procedures Used in Questionnaire Survey.*** A printed form of the questionnaire was used in the survey. Since the printed questionnaire can be completed even in a non-technology supported environment and at the convenience of the participants, it was expected to increase the rate of responses in the selected context. Additionally, a representative was identified from each of the data collecting organisations who encourage respondents to complete the questionnaire and return. The participants were provided with an information sheet explaining the study purpose and informed about the ability to withdraw from the project before returning back the filled questionnaire. Returning the filled questionnaire in the sealed envelope provided was interpreted as consent from the participants to use their data in our study.

3.2.3 ***Survey Data Analysis.*** We categorised the respondents as employees and employers for the analysis. The senior management level employees were considered as playing an employer role in the banking and finance sector since they represent corporate management and obtain a share bonus and incentives from the profit. The middle and operational level employees cover all other executive and clerical grades respectively. The usefulness of features that respondents ranked in order in a 1 (lowest) to 7 (highest) Likert scale were grouped, taking respondents who represented senior management level as employers and others as employees. The mean score for each feature for employees and employers were then compared to identify their preferences.

4 FINDINGS AND DISCUSSION

The overall health and well-being of employees has an impact on both employees and employers [51]. Thus, employee-employer relations should be systematised and paid more attention. Our analysis of the information needs of health and well-being is thus viewed from both employee and employer viewpoints. Here we report the information concerns related to employees health and well-being based on the analysis of both employee and employer viewpoints.

Based on our findings, the information needs related to employees are mainly focused on ways to protect their overall health and well-being covering six areas, namely physical health, emotional health, healthy behaviours, work environment, basic access and overall life evaluation. The analysis of focus group discussions revealed that office-based employees are highly concerned about physical health, emotional health, healthy behaviours and their basic access. According to the participants, stress is the most common emotional health issue with office-based employees, while the biological measures that lead to common non-communicable diseases and health-related behaviours are in their focus. Employees expect their employers' support in providing a better work environment and basic access to a healthy workplace. Information concerns identified through focus group discussions are summarised in Table 1.

Table 1: Employee concerns identified in focus groups

Theme	Sub-theme	% (n)
Physical Health 81% (21)	BMI/Weight and Height	27% (7)
	Blood sugar & pressure, Cholesterol	65% (17)
	Critical illnesses	23% (6)
Emotional Health 81% (21)	Stress management	81% (21)
	Sharing feelings	15% (4)
Healthy Behaviours 81% (21)	Physical activity	58% (15)
	Dietary pattern	58% (15)
	Sleep pattern	8% (2)
	Water consumption	31% (8)
	Alcohol consumption	8% (2)
	Tobacco use	4% (1)
	Preventive care	35% (9)
Work Environment 54% (14)	Organisational culture	19% (5)
	Workplace ergonomics	23% (6)
	Leadership/ Management	23% (6)
	Working condition	31% (8)
Basic Access 81% (21)	Basic health access	65% (17)
	Basic financial access	19% (5)
	Basic community access	31% (8)
Life Evaluation 42% (11)	Work-life balance	38% (10)
	Life objectives	15% (4)

Employees like to have personalised basic physical health information presented in an understandable manner. They identified body mass index (BMI) through height and weight as important to gauge their current level and proper guidance to maintain recommended standards. Additionally, the most critical biological health measures, namely blood sugar level, blood pressure and cholesterol levels, which sign the risk of common non-communicable diseases, are among the much-needed aspects of health. They see the importance of frequent tracking and risk indications to prevent potential sicknesses. They also highlighted the importance of information on risk indicators such as diabetes and cholesterol, comparing standards and personal levels in a simple way to understand. The use of reliable sources in deciding the risk and the recommendation of a doctor for further action were also identified as important. Moreover, they see the information on critical illness as important for two reasons. One is to manage the situation, and the other is to request a job change from the employer. Though the cases they have explained are different from person to person, the importance of maintaining a good physical health condition was accepted by the majority (81%) of the participants.

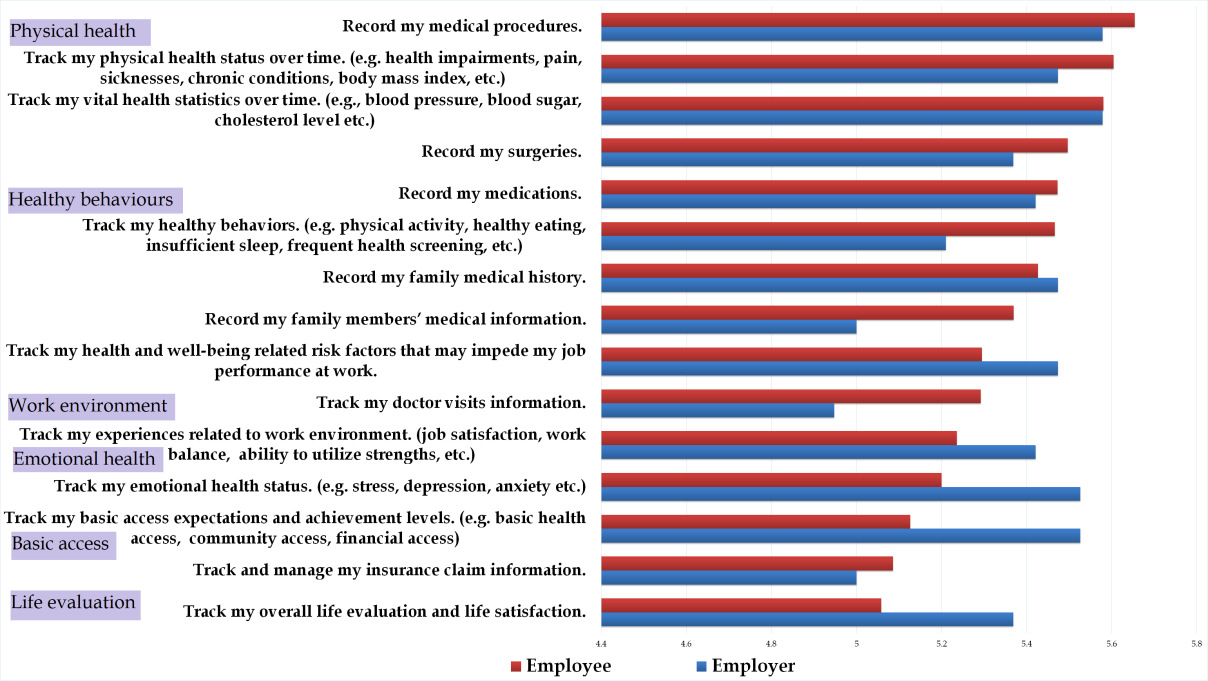

Figure 1: Features believed to be useful for overall health and well-being management using ESPHRs.

Participants in the focus groups identified that they require peace of mind to concentrate and perform their work, which is mostly of knowledge creation and dissemination. Many participants (81%) defined stress as the most difficult thing to handle for office-based employees in an organisation out of all emotional health conditions. An idea came up that the stress is higher for private sector employees than employees in the government sector since they are more goal oriented. The focus group participants commonly agreed that employees nowadays are task-based and sometimes they are compelled to work till late or at night, and complete the task to provide their deliverables on time. For that reason, they explained that stress has become a part of their work routine. They mentioned that all stresses come from their work, yet did not give any indication that they are time-related stresses or social stresses. A possible link between the stress and other diseases such as diabetes and cholesterol was also discussed in the focus groups. They shared their experiences about having headaches and gastritis as symptoms of stress. Among the different parties who they can share emotional health information with, some (15%) identified a friend in the same organisation or a family member/spouse as the party they usually share matters that bother them. Most (81%) agreed on the impact of their workload on stress and the negative effect on the quality of work. Thus, continuous check-ups for stress, information to self-understand symptoms of stress as well as the way to make employer understand employee stresses due to increases in workload were identified as important to employees.

The participants identified physical activity (58%) and dietary patterns (58%) as the most important health behaviours more than other behaviours needing concentration. Participants highlighted their office based lifestyle as the probable reason for getting less chance to engage in physical activities. Thus, exercises such as jogging, walking, engaging in a sport related activity and distance running are some of the methods they use to maintain their physical health. Participants mentioned that the need for exercising is increased due to unhealthy diets. Engaging in housework was identified by a few male focus group participants (8%) as a method for burning body fat. Focus group participants explained that most of the organisations which consider employee inactivity seriously are providing necessary facilities and encourage employees to make use of these. We were surprised by the almost negligible interest in tobacco use among the participants. Though we suspect that participant may purposely hide such behaviour in the discussion, we accept the result since our objective was not to asses actual health data of participants.

Focus group participants showed their concern about organisational culture, workplace ergonomics, leadership and working conditions related to employee health and well-being. The majority of the participants (81%) identified the workplace as the origin of many stresses. The participants agreed that workload and the pressure of reaching deadlines are the main causes of stress at work. Organisational culture, giving the feeling that all employees mutually take care of others in the organisation, was identified as one strategy to manage stress by focus group participants. Focus group participants as a whole prefer to have clear information about their working conditions and the type of work to be performed. Additionally, information about health and safety measurements implemented in the workplace are also of concern.

Participants in the focus groups claimed that most industrial sector organisations and all banking and finance sector organisations offer free life and medical insurance cover based on an employee's

position. All of the participants thought that the facility of settling the medical bill by the organisation is a kind of relief for employees in terms of the financial burden linked with medical care. The company sponsored periodic medical check-ups in sectors such as manufacturing, banking and finance have encouraged participants to be more concerned about their health. According to the comments of participants, employees' information needs to cover areas of health, financial and community access. Employees are usually concerned about their job role related to working hours, free time for regular workouts, and leave entitlements.

Focus group participants stressed the importance of a schedule to balance work and family life. Participants interpreted the satisfaction in their life as doing what they prefer, balancing life and work activities to reach their own goals. Due to limited chances to pay attention to their health during work hours, most participants have aligned their family activities with their health concerns. Some participants (15%) explained that they believe that involvement in domestic activities is good for their health rather than doing physical exercises in a separate place outside. Focus group participants stated that most of them have started to think about their health with their age. Participants confirmed that showing the importance of the personal health of an employee and the employee's family is more effective than an email or an alert indicating a risk or vulnerability to scare the employee.

From our survey data analysis, we confirmed the findings of the focus group discussions and found some interesting findings related to the use of information on overall health and well-being in ESPHRs. Figure 1 shows the features that employees and employers identified as useful for overall health and well-being management using ESPHR systems in an environment that employee given the freedom of sharing preferred health and well-being data with their employer. Based on this analysis both employees and employers are more interested in tracking information relevant to physical health over time, including the vital health statistics, namely blood pressure, blood sugar, cholesterol level, etc. Additionally, features to track healthy behaviours through an ESPHR system were identified as useful by both employees and employers. Comparatively, features to track emotional health, work environment, basic access and overall satisfaction were identified useful to have in ESPHR systems by employers rather than employees. This means from the health and well-being domains we identified in focus group discussions, the employee sees more usefulness of managing information relevant to physical health and healthy behaviours through an ESPHR system, while employers value the usefulness of employee information relevant to their emotional health, work environment, basic access, and overall life satisfaction. Confirming our focus group discussions' findings, employers showed more interest in having features to identify health and well-being related risks that impede performance at work. Interestingly, track and managing insurance claim information in an ESPHR system was identified as one of the least important features that all the employees in different job grades would like to have in ESPHR systems. This finding invites us to rethink the inclusion of information relevant to insurance or financial matters linked with health inside ESPHR systems, though some well-known ESPHR providers (such as Dossia as reported by Terry [54]) implement ESPHR systems depending partly on insurance claim data.

Previous research on PHR systems identified the categories of health-related information that should be contained in a standard PHR system [3, 35]. However, one reason for the low adoption of PHR is the design of PHR systems from the clinicians' perspective rather than the consumers' perspective [53]. In occupational health and wellness research, employee health and well-being was identified as a multi-dimensional concept which combines general health, life experiences, job-related experiences and facet-specific factors [14]. Subsequently, six dimensions were used to measure the concept of employees' overall health and well-being [18]. Despite the interest in using an employer-sponsored PHR system to improve employee health and well-being, less attention has been given to the identification of the information needs of employees and employers that should be considered in an ESPHR system.

Based on the findings of focus groups and the survey, we categorised the health and well-being data for ESPHR systems from the view of overall health and well-being. In addition to the personal demographic, and emergency medical and critical information categories in traditional PHR systems defined by Agarwal [2], we observed the need of a health and well-being data model specific to ESPHR systems. Therefore, considering the findings of this study from the view of employees' overall health and well-being in occupational health, we propose a data model for ESPHRs as shown in Figure 2. The sub-themes identified through the analysis were categories as sub-components of the data model. Additionally, some of the sub-components were further categorised using the information concerns of occupational health and well-being identified in previous literature.

With this, we propose six health and well-being domains identified in the data model as the main data tables in a logical data model of future ESPHR systems. Accordingly, information in each sub-domain can be identified as fields by breaking them into manageable data units (e.g., for BMI-height and weight). The main data tables in an ESPHR logical data model can include a time-stamp for each data unit in sub-domains such that any data updating is recorded with the date and time. Additionally, tables can be created to record historical data (diary tables) in each sub-domain when the data is updated in the main tables. Therefore, employees' health and well-being profile can be formulated in ESPHR systems covering overall health and well-being.

These findings were useful for the purpose of the design and development of an enhanced ESPHR system prototype which we have used to achieve the objectives of our overall project. As the participants of the focus groups highlighted the importance of privacy and security of their personal health and well-being information, we strongly believe the need of full information control in the system should be in the hands of the employees.

The findings of the study should be balanced against some limitations. We acknowledge the inherent issues in focus groups such as biasness and representation, and thus took measures to mitigate them through the involvement of two individuals for data analysis and interpretation. Additionally, we recognised the bias in self-reported data of a survey due to a lack of understanding about the questions and have tried to address this limitation by providing more information in the questionnaire. Further, we caution against generalising the findings as this study was limited to a sample from

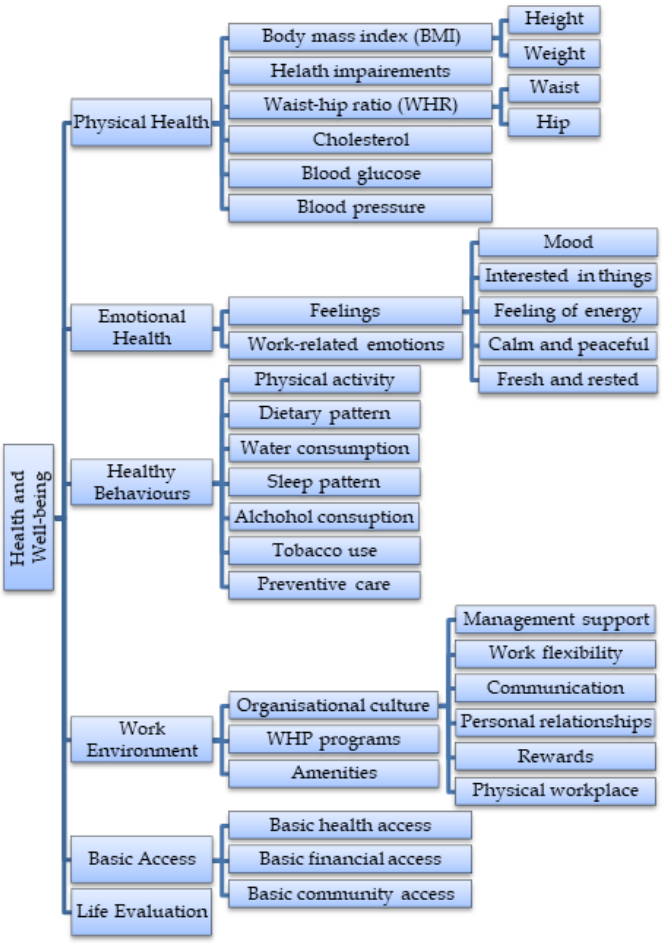

Figure 2: Overall health and well-being data model.

a developing country. We acknowledge that a sample from a different context such as Australia has the potential to produce additional health and well-being sub-domains to the data model. However, following the Collingridge and Gantt [11] argument on analytical generalisability we claim that the findings of this research can be used as a guide to another work environment in a different country with a reasonable judgment.

5 CONCLUSIONS

This study identifies a data model for employer-sponsored personal health record (ESPHR) system from a broader view of the overall health and well-being of employees. The health information needs of individuals in traditional personal health record (PHR) systems have been identified in previous studies. In this study, we contributed to this stream of research by giving special attention to the overall health and well-being of employees in an occupational environment that has not been considered earlier in ESPHR systems. We identified six categories of information namely physical health, emotional health, healthy behaviours, work environment, basic access, and life evaluation that can be used as an information content for overall health and well-being in ESPHR systems. Our focus group discussions with the office–based employees and employers revealed that physical health, emotional health, healthy behaviours and basic access are the areas of most concerned employees' overall health and well-being. We also identified sub-categories for those major categories of information that employees and employers believed to be useful in occupational environments.

Through a survey among employees and employers (or their managerial representatives), we identified that employees are more interested in maintaining information on physical health and healthy behaviours while employers showed comparatively high interest in maintaining information on emotional health, basic access, work environment and life evaluation of employees. Accordingly, we have developed a data model for ESPHR systems to include six health and well-being domains and sub-domains relevant for office-based employees. We believe such data modelling will improve the effectiveness of ESPHR systems for both employees and employers. Though there is no proper agreement on how to collect and who should upload this information to ESPHR systems, we confirm that employees must be given the full control of information in an ESPHR system. Employers should not be given direct access to employees' critical health information unless employees are ready to share them. In such an environment, employees have the freedom to share information with their employer and employers can use ESPHR systems to foster a culture in organisations for shared health and well-being responsibility.

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