Abstract—Problem: Occupational stress has become a key source of stress among the working population which has created numerous negative impacts on the community and of worldwide organizations, and they are expected to become a major health hazard in the forthcoming decades. Objective: This article aims at providing a systematic review and a descriptive evaluation of the interventions supported by ICT (Information and Communication Technology) for occupational stress management. Methods: A systematic review of three databases (Scopus, Web of Science and MEDLINE) was carried out using broad search queries and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were followed to ensure a transparent and replicable process. Results: This article provides a quantitative and qualitative description of 20 studies about occupational stress interventions supported by ICT. The following factors were considered for the analysis: the form of the intervention, the focus of the intervention, and efficacy of the intervention. Conclusions: The systematic review demonstrated that ICT supported stress management interventions are effective in most of the situation. It is also highlighted that a clear gap appears to exist between work-stress theories and ICT applications available for occupational stress management.

Keywords—Occupational stress, ICT, Intervention, Digital, Mobile, Web, Efficacy

I. INTRODUCTION

Stress is a global phenomenon and a major healthcare challenge in the 21st century. Almost everyone is exposed to a wide range of pressures in both personal and work life. Some individual's cope very well with this pressure, on the other hand, some individual's find it difficult to manage the situation, and that is when individuals fall into the "stress".
than 100,000 employees revealed a significant increase in stress, anxiety, and depression [6]. Same survey data shows a dramatic increase in the number of employees who are reporting serious mental and emotional health concerns. Studies exploring the impact of work-related stress on occupational outcome have discovered forms of stress behavior affecting competitiveness, productivity, and the public image of the organization [7]. For example, besides the impact on workers’ physical wellbeing, a poor psychosocial working environment contributing to work-related stress can result in increased absenteeism and presenteeism, as well as reduced commitment, motivation, and satisfaction, along with a greater rate of staff turnover and intention to quit [7].

Pestonjee [8] suggested three important aspects of life from which stress is originated, i) job and the organization, ii) social sector, and iii) intra-psychic sector. The job and organizational sector referred to the work environment. The social sector referred to the social and cultural context of an individual’s life. The last factor, the intra-psychic encompasses things which were intimate and personal to an individual. The present study has focused on the job and the organizational sector. Human behavior within an organization influenced by many factors, such as physical, social and psychological. The type of relationship employee had with the organization was defined by the term “role.” Every individual in the organization had an assigned role to play. Through the role has defined set of responsibilities where an individual interacted and got interacted with the system. Therefore, an organization can be considered a system of roles [9].

The interventions applied to occupational stress can be categorized according to their scale [10]: individual and organizational. Furthermore, the interventions can also be classified according to their purposes [10] such as identification, primary prevention methods, secondary prevention methods, and tertiary prevention or treatment. According to Schaufeli et al. [10], there are few well-designed studies concerning the intervention in occupational stress. Also, these studies have demonstrated that the interventions studied benefit only a reduced number of people and are carried out by an instructor/therapist in a physical location. The use of Information and Communication Technologies (ICT) can help to improve the efficiency of interventions, since it is possible to carry them out at a larger scale, regardless of time, place, or group of people [11]. In the same way, the user can access information in a quick, easy, and confidential manner [12].

This review was motivated by the research undertaken for the design and development of ICT supported toolkit for occupational stress management. Thus, this study aims to answer the following research questions; 1. what is the form of intervention? 2. what is the focus of the intervention? And 3. What is the efficacy of the intervention? This article elaborated the outcome of a systematic review and a descriptive evaluation of interventions supported by ICT for occupational stress management.

II. METHODOLOGY

A. Approach: Systematic Literature Review

Systematic literature review uses “a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing an existing body of completed and recorded work produced by researchers, scholars and practitioners” [13]. This approach was initially developed for synthesizing medical research evidence, but then it is increasingly used in other fields, such as social and business studies [14]. In contrast to narrative reviews and scoping literature reviews, systematic reviews focus on specific research questions with narrow parameters called rubrics; the selection process is guided by a set of inclusion/exclusion criteria and extract data only from the included studies; all the included studies are evaluated for the quality using different set criteria, and derive conclusions on the evidence/findings relating to the initial research question(s) [15].

B. Search Strategy

During the systematic literature review process, a rigorous search strategy and inclusion criteria were used to obtain articles relating to ICT supported interventions for occupational stress management. Three international research databases (MEDLINE, Scopus, and Web of Science Core Collection), relating to health, technology, and social science disciplines were cross-examined on December 02 and 03, 2018 via Stockholm University library portal. To search for articles, keywords were identified under four main topics (Occupation, stress, ICT, and Intervention). The keywords used to represent occupation were: burnout, occupational, workplace, work-related, job-related. The keywords used to identify stress
were: stress and burn-out. The keywords used to signify ICT were: ICT, internet, mobile, web, informatics, digital, and computer. The keywords used to refer interventions were: intervention, prevention, therapy, and management. Based on the above keywords following complex search query was constructed: (“occupational” or ”workplace” or "work-related" or ”job-related”) AND (“stress” or ”burn-out”) AND (“ICT” or ”internet” or ”web” or ”mobile” or ”computer” or ”digital” or "informatics") AND (“intervention” or ”management” or ”therapy” or ”prevention”). The search was limited to the abstracts, keywords, and titles of the articles. To ensure a transparent and replicable process, the PRISMA guidelines were followed [16].

C. Article screening, selection and quantity assurance

The broad search query was executed on selected databases (Scopus, Web of Science, and MEDLINE) and resultant article set was then screened in three iterations based on different exclusion/inclusion criteria.

At the first iteration, the following inclusion criteria were established: articles published within 2008-2018 in English language and published in journals or conference proceedings. To assure the quality of the articles master thesis, news reports, textbooks, and unpublished working papers were excluded. The resultant article set then screened to eliminate duplicate entries within three database search results. Microsoft Excel “Remove Duplicate” feature was used to eliminate duplicate entries from the result set. At the second iteration titles and abstracts screening was carried to eliminate articles that did not use ICT in the interventions or that did not focus on occupational stress. At the final iteration, articles were screened rigorously based on the content of the article. Following exclusion criteria were used for the final screening; 1: no full text or detailed methodology section available 2. Occupational stress is assessed as a minor part of large-scale mental health issues 3. Comparisons, evaluation, and reviews of ICT supported stress intervention 4. The technical aspect of the ICT intervention is discussed with no focus on evaluation. To the end of the third iteration resultant article number further reduced and the final selection was forwarded for final analysis. The selected articles adhered the set inclusion criteria, journal and conference papers in English published under the topic ICT supported interventions for occupational stress management within 2008 to 2018 period. Since no major discrepancies identified therefore selected 20 articles were forwarded for data extraction and thematic analysis.

D. Data extraction and thematic analysis

The author extracted information from all eligible studies using a structured Excel form containing the following headers: study authors, publication year; sample setting (the type of occupation in which the study was conducted, size of the sample); type of intervention used; study design; intervention delivery mode (the type of ICT used, duration of the intervention, support or guidance provided during the intervention); focus or scale of the intervention (individual, organizational, individual/organizational level); underpinning theoretical basis; and main findings (conclusions, comments).

The extracted dataset further analyzed in two main aspects; intervention used, and methodology adopted during the study. To analyze the interventions used in the studies, three rubrics were formed; 1. The form of intervention 2. The focus of the intervention and 3. Efficacy of the intervention. Each study was classified according to the treatment/therapy used (form), intervention level (focus) and the effect (efficacy) of the intervention compared with a control state. Next, to investigate the methodology implemented within the selected studies, three sub-questions were formed; 1. What is the methodology adopted during the study (sampling technique, data collection, and data analysis), two how they have implemented in the study and 3. Why this methodology was selected (purpose, advantages, and disadvantages). A three-level stress scale was designed to describe the efficacy of the intervention. The symbol “POSITIVE” was used to represent a positive effect of the intervention in stress; the symbol “NEGATIVE” was used to represent a negative effect, and the symbol “ID” was used to represent an indeterminate effect. The acronym “DNA” (Does Not Apply) was used for studies under development that did not give conclusive results, or that did not assess the effect of the intervention. These rubrics provided a convenient means of categorizing study findings to achieve the main objective and their intended outcomes.

III. RESULTS

1429 results were generated by the search strategy, and 789 titles and abstracts remained after applying exclusion criteria one at the first iteration.

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Of these titles/abstracts then screened for duplicates. From resulted in 673 articles/titles, 470 was removed because they were not related ICT supported stress interventions for occupational stress management. After applying exclusion criteria, three at the third iteration another 176 were removed as they were discussing technical aspect of the intervention or reviews related to ICT intervention or stress is assessed as a minor part of a large mental health problem. After examining the full texts and excluding articles not appearing to meet the inclusion criteria, 27 publications remained. In summary, 20 publications representing 5 qualitative ([17], [18], [19], [20] and [21]) and 15 quantitative ([22]–[36]) studies were included in the final analysis.

A. General publication statistics

All the 20 qualifying articles were published within the last ten years (between 2008 to and 2017), peaking in 2016 when six were published. The majority (15 of 20, 75%) of the studies were conducted in 2013 to 2017 period. The interventions have been carried out in German (25%), Japan (20%), Sweden (15%), United States (15%), Finland (15%), Great Britain (5%) and Hongkong (5%). All the selected studies were published as journal articles.

B. General statistics of the ICT Intervention: Form, Focus, and Efficacy

i. The form of the Intervention

The form of intervention were analyzed using five sub rubrics; delivery mode, intervention technique, theoretical baseline, intervention period, and guidance/support rendered within the duration.

It was noted that the majority of the interventions were primarily delivered via the website (9 of 20, 45%). Six interventions were delivered solely via a mobile platform. While three studies delivered in a “blended” format using web/mobile and web/email platforms. Two other studies used only computer platforms.

Moreover, four interventions (20%) were adopted Cognitive Behavioral Technique (CBT), and two studies followed Mindfulness practices, and three other studies followed Acceptance-Commitment Theory (ACT). One study followed a combination of Mindfulness and CBT technique, and another study followed Behavioral Activation Treatment. Out of 20 studies, 9 followed different program content related to the profession of the study population.

However, considering the underpinning theoretical model or framework followed during the intervention it is noted that majority of the interventions (12 of 20, 60%) did not follow any theoretical model or framework where only 40% followed a theoretical baseline. Lazarus’s Transactional Model of Stress (TMS) was used in 3 of 20 studies. One study followed the Social Cognitive Theory. Other four studies did not follow any theoretical model or framework but referenced different concepts (self-efficacy, Serious gaming, and blended learning) in the delivery of the program.

Considering the intervention period, most of the studies (8 of 20, 40%) followed 6 to an 8-week duration where 20% of the studies followed 3 to 6 months period. One study was delivered within 7 days. The maximum intervention period is six months, and two studies have not discussed the intervention period.

Guidance and support from program facilitators or therapist were delivered through various modalities including e-mail, text message, phone call, support groups, e-coach feedback, and online forum moderation where the majority of interventions (12 of 20, 60%) delivered with minimal to moderate level support and guidance and eight studies did not indicate whether support or guidance received from the facilitators during the intervention.

ii. The focus of the Intervention

The focus of the intervention sub-themed using the following rubrics; the scale of intervention and target audience. To accurately illustrate the included literature, the scale of interventions described in these studies were categorized as "individual," "organizational," or "individual/organization interface" focused regarding their target strategy, based on a categorization proposed by De Frank and Cooper [1]. "Individual-focused" interventions support employees undergoing stress symptoms and provide them with knowledge and skills needed to cope effectively with their personal levels of stress. "Organizational" interventions address aspects of the working environment that may be stress-inducing. They generally aim to create a less-stressful friendly environment for employees.
Finally, "organizational/individual interface" interventions aim to resolve issues as these relate to interactions between employees and their organization, such as role conflict and person-environment fit [2].

According to the analysis, the majority (17 of 20, 85%) of the interventions focused on "individuals" aspects where 10% addressed organizational level, and 5% supported both organizational/individual interface.

Study samples covered a variety of working environment including academics (20%), health sector employees (15%), technical/technological officers (10%), sales officers (10%), customer care officers (10%) and other working professionals (35%). Majority of the study settings established in western countries (e.g. Sweden, Switzerland, etc.) and one study was conducted in Japan working environment.

Individual-level interventions delivered via different types of modalities including web, mobile, email, computer-based or using blended approaches. Comparatively, organizational and organizational/individual interfaces were catered only with web platforms. All the organizational level interventions followed specific training programs related to their work environment than practising standard CBT or Mindfulness programs. At the organizational/individual interface, web forums were used to facilitate two-way discussions whereas individual-focused interventions used CBT, Mindfulness programs, Behavior Activation Treatments, ACT or combination of CBT and Mindfulness programs.

### iii. Efficacy of the Intervention

From analyzing the efficacy of interventions, it was noted that 15 out of 20 studies (75%) had a "POSITIVE" effect on occupational stress, three studies had "NO EFFECT," and two studies did not apply because they did not measure the impact of the intervention.

Among the interventions supported by Web technologies, 66.67% (6 studies) had a positive effect on the occupational stress; 33.33% (3 studies) had a no effect on the stress levels of the employees. From the interventions delivered via a mobile platform, four studies out of 6 had a positive effect, and two studies did not assess the effect of the intervention. Interventions delivered using a blended approach; web and mobile platform had a 100% positive effect on occupational stress. For the interventions supported by computer platform (2-studies based on standalone software applications) yields 100% efficacy.

Considering the focus of the intervention, studies which had "individual-level" focus marked 82.35% positive effect and 5.88% did not affect occupational stress level. The interventions targeted both individual and organizational level (only one study) had 100% positive effect and interventions targeted only organizations recorded no effect on the stress levels.

The interventions followed CBT, Mindfulness techniques, and Behavioral Activation Treatment techniques had a 100% positive effect on occupational stress level whereas blended approach on CBT and Mindfulness study did not assess the effect of the intervention. The ACT enabled interventions recorded 66.67% (2 studies) positive effect on the occupational stress level.

The ICT supported interventions guided by a moderator/facilitator or a therapist, had a 75% (9 of 12) positive effect on occupational stress level while unguided/unsupported interventions resulted in 62.5% positive effect.

### IV. DISCUSSION

The results of the present studies are also consistent with those of previous studies regarding major work-related stressors, effects of stress on health and stress management strategies. But considering the sample size and selection strategies occupied during the study limits the transferability and generalizability of the findings beyond the study environment.

Majority of the studies followed Randomized controlled trials (RCTs) approach. RCTs are the type of field experiment in which effects of treatment is measured in trials involving comparisons between experimental and control group. Selected approach is a key strength of this type of studies as RCTs are considered as the gold standard for research design in medical and health research concerned with health interventions.

All interventions except those carried out by Leung et al. [18], Kawakami et al. [36], and [35] were focused on participants individually, which in turn is consistent with reports by Shaufeli [10]: “the majority of interventions in burnout are carried out on an individual basis.” It is also noted that interventions yielded a significant level of efficacy
when the study is involved in participants with recognized high-stress scores when persons who take responsibility for the treatment benefit more from unguided interventions. When considering the focus of the intervention respondents prefer tailored treatments than following generic activities[17]. It is also noted that sending frequent, daily notifications may enhance exposure to intervention content without deterring continued engagement. These are major design concerns that need to focus on the design stage of the ICT intervention.

A clear gap appears to exist between work-stress theories and available ICT interventions for occupational stress management. It is also noted that no proper evaluation mechanism is available to measure the effectiveness of the ICT intervention. Thus, further research efforts are necessary to fulfill this theoretical and empirical gap.

V. CONCLUSION

This article described the state of the art of recently published studies related to interventions on occupational stress management based on ICT. Based on the evidence, it can be considered as a guide for the design, development, and evaluation of future interventions.

REFERENCES