

## Designing an app for managing stress in the construction industry

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## **ID 3907: Designing An App For Managing Stress In The Construction Industry**

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### **ABSTRACT**

High levels of stress at work, great responsibilities, hazards and lack of balance between tasks and deadlines are common in the daily lives of many construction workers. Changing the patterns of thinking and behaviours is not an easy mission, and it requires constant support, learning and determination. E-health applications can contribute to this change through their ability to foster continuous interaction with the user. Mobile phone apps have shown promising results in the field of ‘e-health and wellbeing’. Accordingly, an App is being designed as a self-help system for stress management which will enable construction workers to 1) detect the onset of stress quite early, 2) track their stress status, 3) empower persons to cope with stressful and/or demanding situations in an adaptive way, 4) improve and streamline the operability of job tasks, and 5) optimise efficient solutions for the construction industry. The development of this innovative app, known as *Streblo*, is part of a wider research that is studying stress management in the construction industry. *Streblo*’s blueprint will match personality traits with coping strategies in real-life situations. Its inputs are being generated from a field study that has commenced, where structured interviews have been used to collect data from construction workers on their 1) personality and 2) behaviours while experiencing stress. Results of the data collection and analysis are being used to develop *Streblo* (an App) with IT experts. The paper reports the detail development and performance of *Streblo*’s prototype. Ultimately, users will be able to engage *Streblo* on electronic devices (mobile phones, tablets, computers) through both text and image-based communication to obtain real-time solutions and feedbacks on their stress status. *Streblo* will enhance and support attitude and behavioural changes in people who suffer from stress symptoms in the construction industry.

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## INTRODUCTION

Due to the risky and often problematic environments of construction projects, time management and other crisis-ridden working issues, the construction industry has long been known to be a stressful (Bowen et al., 2014; Chan et al., 2018). Stress arises when there is an incongruity between a worker's estimated capability and resources and actual context to cope with his or her activity (Leung, Liang & Yu, 2016; Haydam & Smallwood, 2016). However, not all stress is negative. Stress impacts not only on individuals' physical and emotional status, but also on their job and general performance in terms of efficiency, outputs, teamwork and collaboration (Leung, Chan & Cooper, 2014; Enshassi et al., 2018). It is therefore important for players to cope with a challenging construction industry be able to deal with stress (Bowen, Govender & Edwards, 2014; Chan, Leung, & Yuan, 2014). In psychological terms, the ability to deal with stress is called 'coping' and it represents the behavioural and cognitive solutions an individual adopts to manage stress (Lazarus, 1966). Coping behaviours may be adaptive (when they help people to find efficient solutions to their stress) or maladaptive (when they cause detrimental effects at the physical and/or emotional levels).

### *E-self management applications*

E-self management applications may represent a valid support to managing stress and they can easily be adapted within the work environment (Wu et al., 2017). E-self management applications can contribute to monitoring the level of stress and users' health status through their ability to foster continuous interaction. Particularly, mobile phone apps solutions have shown promising results in the field of 'self-management and wellbeing' (Payne et al., 2015; Whitehead, & Seaton, 2016). Apps can be implemented in work settings and can be receptive to the unique needs of workers with a mental health condition. Individuals can choose different functionalities of apps toward managing their particular problems and grade of severity. In addition, apps can include components that permit personalization to further adapt to a specific user's needs and goals (Shaw et al., 2014; Jonkman et al., 2016).

The potential usefulness of apps may be superior for some specific mental health conditions, such as stress. Mobile applications for stress management have been applied in different sectors (e.g. health) with promising results (e.g. Gaggioli et al., 2014; Engel et al., 2015; Khusid & Vythilingam, 2016). However, no construction-specific application exists. Hence,

the aim of this paper, based on an underpinning research, is to attempt to describe the design of an interactive App for construction professionals for coping with stressful events at the workplace. The overall goal of this app is to project a tool that is able to detect:

- 1) Early sign of stress; that is the mental and physical state resulting when the resources of the individual are inadequate to cope with the demands and pressures of the situation.
- 2) Stress consequences that can undermine the achievement of goals, both for individuals and for organisations; monitor these; and propose innovative solutions to overcome problems for construction workers.
- 3) Signs of stress that can be seen in people's behaviours. Responses to stress may be in the areas of feelings (e.g. anxiety, depression, irritability, fatigue), behaviour (e.g. being withdrawn, aggressive, tearful, unmotivated), thinking (e.g. difficulties of concentration and problem solving) or physical symptoms (e.g. palpitations, nausea, headaches).

## METHODS

The development of the Streblo app (prototype) included participatory design (interviews) with inputs from different construction workers (N = 20) and IT academic staff (N = 3). Brief structured Interviews facilitated the assessment of user needs and afforded potential consumer input into the app's focus and features. Table 1 describes the content of these brief interviews.

Table 1. Interview guide

<b>Construction workers' questions</b>	<b>IT academic staff's questions</b>
Which are the main features that a technological tool should have to help persons to cope with stress?	Which are the technological requirements for a good app?
	Which services an app should provide?
	How to incorporate graphical aspects?
	How to design a tool feasible for construction workers (office based and site based)?

## RESULTS

Answers were transcribed and summarised, manually. Suggestions generated from this process led directly to the development of *Streblo*'s features and content. For example, some research participants requested tools that they could use easily at the workplace (e.g., for remembering previously inserted or stored user-data). Some participants also wanted the app to provide a record of the suggestions received. Employing this user-centric design procedure was intended to develop an app that would be most relevant to users' needs and provide functionalities that was most attractive to them. *Streblo* is being designed to be used either as a stand-alone psychological and self-management tool or to cope efficiently with stress at the Construction workplace.

Results of the preliminary data collection have permitted the delineation of the main features of the *Streblo* app (as highlighted on Table 2):

Table 2. Features of *Streblo*

<b>Main features</b>
• <i>Graphical-friendly</i> (the tool has to be graphically easy to learn and use);
• <i>Fully integrated in their usual smartphone</i>
• <i>Customizable</i> (lay people with no programming skills should be able to use all the functionalities);
• <i>Discreet</i> (the application should not interfere with normal mobile phone usage or with normal working routine activities).

### **The *Streblo* app**

#### Design Principles

The following design inputs and principles generated through the research were applied in developing the prototype web-based stress management system:

a. *Social connections*. New information and knowledge are shared when different workers are invited to online conversations. Also, people with previous situation of stress, who have managed to recover from difficult situations in construction job activities, can contribute with their insights. By this, both strong-tie and weak-tie relationships are made possible.

b. *Self-Learning on Stress*. Through questions and practical experiences, users can get help in their learning processes and become more aware of them and more confident to cope with them.

c. *Wide range of solutions*. The system should help the users to enhance their strategies in order to better cope with stress positively. This can be obtained in various ways, through an array of behaviours, such as advice on how to approach a specific stressful situation, and how to interpret a particular event and demanding requests.

d. *Constant e-Learning*. Continuous efforts are needed for people who want to change maladaptive coping behaviours and patterns of actions. Therefore, it is important that the system has tools for ongoing help in everyday events at the workplace.

e. *Practical App*. The inner architecture of the system is learning based on the users and their experiences. By identifying good solutions and adaptive behaviours, feedback on what goes on in the users' lives is available, and the system can be adjusted when necessary. For example, exercises can be tailored to better fit the needs of the user for a particular circumstance.

f. *Multimedia Tutorial*. E-learning between the user and the system is mediated by the use of a tutorial. Breathing exercises can, for example, be easily demonstrated through online video clips. Likewise, other exercises can be recommended to mitigate stress.

### Web system components

The app consists of four major sections:

1. *Who are you?:* This section provides psychological information about personality (e.g., symptoms, prevalence rates, how it develops) and various types of behaviours that are available. It includes information about habitual behaviours, cognition and emotional patterns.

2. *Self-Assessment*: This section includes the Streblo COPE Inventory version (a well-validated, widely used self-report that measures the ways to cope with stress. After completing the COPE, users are provided with interpretive feedback about the efficacy of their coping strategies (adaptive, maladaptive strategies or alerting information). Users can also track their strategies over time by viewing a line graph of past assessments. Finally, users can schedule future assessments at regular intervals (e.g., monthly).

3. *Manage stress*: This section provides solutions to help address stress symptoms and manage difficulties at the workplace. When a coping behaviour is selected, the user is invited to check if the coping solution adopted is adaptive or not. If not, the system offers solutions to the user. Depending on the problem selected, the user is offered a psychological-based coping tool (e.g., paced breathing, progressive muscle relaxation, concentration exercises, engage in pleasant events option) or an organisational-based coping tool (e.g. divide your task into subtasks, identify priorities). If users do not like a solution presented to them, they can choose another option. Figure 1 illustrates an example of adaptive, maladaptive coping behaviour and associated solutions.

4. *Find Support*: This section allows users to easily reach out to sources of support when needed, including their GP, NHS mental support and other allied organisations that offer help for managing stress. *Streblo* also provides users with a variety of links and phone numbers to facilitate finding face-to-face interaction with qualified professionals.

## **DISCUSSION AND CONCLUSION**

The emergence of mobile self-management and mobile wellbeing solutions heralds the beginning of a new era in personal Management, and it is extremely pioneering in the field of Construction Management. The research described in this paper aimed to assess a prototype innovative app for the manageability of the common stressors faced in construction projects in the UK. *Streblo* has been developed using a robust, bottom-up, qualitative approach that included consultation with as many stakeholders as appeared to be necessary. The first prototype of the app is based on documented knowledge to provide a firm foundation for subsequent refinement which will require inputs from expert stakeholders on fitness-for-

purpose. **At the operational level, Streblo will be tested among different construction workers to measure acceptability and efficacy prior to its public diffusion.**

Coping	Examples of actions	How is this coping behaviour? Green= adaptive behaviour; yellow=pay attention, red=maladaptive behaviour, please change your coping behaviour	Solution/s proposed								
Positive reinterpretation and growth	<p>Identify strengths and limitations</p> <p>Valorise positive consequences related to the problem</p>	Green	<p><i>Job values exercise</i></p> <p>In the main part of each large box, write a few key words about what is important or meaningful to you in this domain of job: What sort of person do you want to be? What sort of personal strengths and qualities do you want to cultivate? What you want to stand for? What do you want to do? How do you ideally want to behave?</p> <table border="1" data-bbox="794 864 1189 958"> <tr> <td data-bbox="794 864 895 958">With my Colleagues</td> <td data-bbox="895 864 979 958">With my clients</td> <td data-bbox="979 864 1064 958">With my boss</td> <td data-bbox="1064 864 1189 958">Other?</td> </tr> <tr> <td data-bbox="794 958 895 1079"></td> <td data-bbox="895 958 979 1079"></td> <td data-bbox="979 958 1064 1079"></td> <td data-bbox="1064 958 1189 1079"></td> </tr> </table> <p>After that, try to reframe your difficulties and your stressful tasks considering what really matter for you and what is really important for your job</p>	With my Colleagues	With my clients	With my boss	Other?				
With my Colleagues	With my clients	With my boss	Other?								
Behavioral disengagement	<p>You begin to withdraw, retreating within yourself</p> <p>Be ashamed</p> <p>Distraction</p>	Red	<p><i>Your values' exercise:</i></p> <p>What really matters to you, in respect to your job?            What do you want to do with your time on your job?            What sort of person do you want to be? What personal strengths or qualities do you want to develop?</p> <div data-bbox="815 1205 1070 1339" style="text-align: center;"> </div> <p>What can you can values closer to your job?</p>								
Focus on and venting of emotions	<p>Get angry and nervous</p> <p>Discussing</p>	Yellow	<p><i>Expansion practice sheet exercise</i></p> <p>Expansion means opening up and making room for difficult feelings, urges and sensations – thereby allowing them to ‘flow through’ you without a struggle. You don’t have to like or want these feelings – you just make room for them and allow them to be there even though they are unpleasant.</p>								

**Figure 1: Coping behaviours and solutions in Streblo model**

An important aspect of Streblo is that a user does not just make an assessment to see if they have a problem with stress in the workplace, but that the app also works to eliminate or at least ameliorate the potential impacts of any identified stressor. While previous research in Construction Management has mainly focused on the effect of stress and its influence on the

performance of an individual and project outcomes, very few studies have touched on the stress experience. The potential of *Streblo* is thus wide and in line with the actual and current needs of professionals working in the Construction Industry. The negative effects of stress at work in terms of emotional disorders and organisational difficulties have urged the need for new tools and solutions, especially direct-to-user tools such as mobile applications. This study investigates how technology has been used to influence adaptive coping behaviours and synthesizes key aspects into a conceptual model for creating a new mobile application. The conceptual model provides further knowledge of key aspects to consider when developing persuasive tools that aim to encourage more efficient ways of coping with stressful events in Construction.

In this paper, we have presented a prototype of a mobile phone app for stress management associated with a web-based system. So far, the mobile phone app has shown promising results when evaluated by criteria from research in the area of stress management and online support. This preliminary work will be followed by user-based evaluations to identify the needs to be addressed in the next iteration of the design. The research reported in this paper constitutes a significant step towards the understanding, and management of, potentially stressful situations and their influence on the efficiency and effectiveness of construction industry participants. Similarly, there are triple bottom line implications for all concerned. In particular, those most likely to be exposed to high stressors may expect to at least receive some serious consideration from their managers and advice for self-help.

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## REFERENCES

1. Bowen, P., Govender, R., & Edwards, P. (2014). Structural equation modeling of occupational stress in the construction industry. *Journal of Construction Engineering and Management*, 140(9), 1-14.
2. Bowen, P.; Edwards, P.; Lingard, H.; Cattell, K. (2014) Workplace stress, stress effects, and coping mechanisms in the construction industry. *Journal of Construction Engineering and Management*, 140 (3), 1-15.
3. Chan, I. Y. S., Leung, M. Y., & Liang, Q. (2018). The Roles of Motivation and Coping Behaviours in Managing Stress: Qualitative Interview Study of Hong Kong Expatriate Construction Professionals in Mainland China. *International Journal of Environmental Research and Public Health*, 15(3), 561 [available online], doi:10.3390/ijerph15030561, Accessed on: 04-04-2018
4. Chan, I., Leung, M. Y., & Yuan, T. (2014). Structural relationships between cultural values and coping behaviors of professionals in the stressful construction industry. *Engineering, Construction and Architectural Management*, 21(2), 133-151.
5. Engel, C. C., Litz, B., Magruder, K. M., Harper, E., Gore, K., Stein, N., ... & Coe, T. R. (2015). Delivery of self training and education for stressful situations (DESTRESS-PC): a randomized trial of nurse assisted online self-management for PTSD in primary care. *General hospital psychiatry*, 37(4), 323-328.
6. Enshassi, A., Al-Swaity, E., Abdulaziz, R., & Choudhry, R. (2018). Coping behaviors to deal with stress and stressor consequences among construction professionals: a case study at the Gaza Strip, Palestine. *Journal of Financial Management of Property and Construction*, [Available online], <https://doi.org/10.1108/JFMPC-12-2016-0057> Accessed on: 04-04-2018
7. Gaggioli, A., Cipresso, P., Serino, S., Campanaro, D. M., Pallavicini, F., Wiederhold, B. K., & Riva, G. (2014). Positive technology: a free mobile platform for the self-management of psychological stress. *Annual Review of Cybertherapy and Telemedicine*, 199, 25-29.
8. Haydam, E., & Smallwood, J. (2016). Mental stress among civil engineering construction site agents and foremen in the Nelson Mandela May Metropole. *Journal of Construction Project Management and Innovation*, 6(1), 1375-1390.
9. Jonkman, N. H., Westland, H., Groenwold, R. H., Ågren, S., Atienza, F., Blue, L., ... & Kempen, G. I. (2016). Do Self-Management Interventions Work in Patients With

- Heart Failure? CLINICAL PERSPECTIVE: An Individual Patient Data Meta-Analysis. *Circulation*, 133(12), 1189-1198.
10. Khusid, M. A., & Vythilingam, M. (2016). The emerging role of mindfulness meditation as effective self-management strategy, part 1: clinical implications for depression, post-traumatic stress disorder, and anxiety. *Military medicine*, 181(9), 961-968.
  11. Lazarus, R. S. (1966). *Psychological stress and the coping process*. New York, US: McGraw-Hill.
  12. Leung, M.Y., Chan, I.Y.S., & Cooper, C.L. (2014). *Stress management in the construction industry*. Oxford, UK: John Wiley & Sons
  13. Leung, M.Y., Liang, Q., & Yu, J. (2016). Development of a mindfulness–stress–performance model for construction workers. *Construction Management and Economics*, 34(2), 110-128.
  14. Payne, H. E., Lister, C., West, J. H., & Bernhardt, J. M. (2015). Behavioral Functionality of Mobile Apps in Health Interventions: A Systematic Review of the Literature. *JMIR mHealth and uHealth*, 3(1), e20. [Available online] <http://doi.org/10.2196/mhealth.3335>, Accessed on: 04-04-2018.
  15. Shaw, W. S., Besen, E., Pransky, G., Boot, C. R., Nicholas, M. K., McLellan, R. K., & Tveito, T. H. (2014). Manage at work: a randomized, controlled trial of a self-management group intervention to overcome workplace challenges associated with chronic physical health conditions. *BMC public health*, 14(1), 515.
  16. Whitehead, L., & Seaton, P. (2016). The effectiveness of self-management mobile phone and tablet apps in long-term condition management: a systematic review. *Journal of medical Internet research*, 18(5), e97. [Available online] , doi: 10.2196/jmir.4883, Accessed on: 04-04-2018.
  17. Wu, Y., Yao, X., Vespasiani, G., Nicolucci, A., Dong, Y., Kwong, J., ... Li, S. (2017). Mobile App-Based Interventions to Support Diabetes Self-Management: A Systematic Review of Randomized Controlled Trials to Identify Functions Associated with Glycemic Efficacy. *JMIR mHealth and uHealth*, 5(3), e35. [Available online] <http://doi.org/10.2196/mhealth.6522>, Accessed on: 04-04-2018.