Article

Prevedil – The development of a mobile application for the prevention of workplace injury

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Abstract. This research protocol is concerning the development of a mobile application for the prevention of workplace injury and work-related pathologies through the design and use of multimedia and interactive learning tools offline.

The design idea aims at protecting the health through the winning approach of two apparently distant thematic areas, namely modern technologies and prevention. From this mixture, we are projecting to make a resolution product or, at the very least, a contributor to hinder one of the major woes of our day: accidents at work. Our challenge is to correct behavioral models and little virtuous attitudes (deriving from cultural, social, familial factors, etc.) related to work procedures, using the new technology communication systems to promote health culture and Safety in workplaces and the dissemination of good operating practices and guidelines aimed at increasing awareness, perception of risks and critical thinking.

Introduction

Injuries and accidents are an important issues in Public health and Clinical medicine (1, 2). The transposition of the European directives on health and safety in Italy, implemented by D.Lgs 81/08, focuses on a thematic approach based on the logical organization of management.(3) This logic is the legislative basis for the introduction of the Single Text on Health And Security, giving increasing importance to the training of workers for the decisive role it plays in the construction

and diffusion of cultural security.(3) Nevertheless, health and safety outcomes are still unsatisfactory, with significant human and financial costs. (4)

Therefore, it is necessary to develop sufficiently sophisticated and specific communication tools: a consistent effort must be made in the search for technological resources aimed at enhancing risk awareness and the culture of safety and security by the main actors.

The app will give you the opportunity, at any stage of work and in offline mode, to know immediately the useful concepts of preventive protection to support "standard" classroom training and provide clear multilingual training tips in health and job security. At the same time, as a memorandum of knowledge already learned, it will be able to provide support to security experts through: basic concepts, guidelines, definitions, minimum requirements, good operational practices and basic knowledge in Health and safety at work. In other words, the idea is to prevent the occurrence of injury events and the conclusion of work-related pathologies through the design of interactive and offline learning tools. Innovative aspects reside in a new multimedia and technological communication (ICT) approach with learning featuring moving images associated with descriptions of foreign language concepts. Effectively, it will be possible to meet the needs of immigrant workers with linguistic difficulties: language and cultural difficulties are an important element in exposure to occupational hazards.(5) In fact, failing to understand the meaning of the words on security signs and imparted instruction or the contents of the same training activity, the operator is faced with dangerous and emergency situations.(3) Operators who are increasingly massive in the building sector.(3) An industry where we decided to focus just because it employs predominantly foreign labor.(6)

However, the scientific research on the application of app use in the field of work-related prevention is scarce (7, 8).

For to have an unequivocal demonstration of the training, it is foreseen that compiling documentable learning tests is planned. The innovation proposal does not only stop training for the prevention of accidents, but it goes beyond inserting applications that can handle the entire security system. To close the circle of services offered, in fact, tools such as the "Training Manager", the "Glossary" or even "My Risks" are implemented, which enable a more complete and fast security management.

Research objectives

We hope for a number of benefits, ancestors of other derivative benefits, such as in a virtuous circle, where triggering represents an increase in levels of awareness and culture in terms of health and safety. In short, a range of research objectives are part of:

1. Development, implementation and testing of the instrument;

2. The spread of the culture of security;

3. Modifying unfeasible behaviors to safe behaviors through the functional dissemination of health and safety concepts;

4. Achieving an adequate threshold of awareness and competence in relation to the risks present in the workplace and its ability to identify and report them;

5. The containment of the incident phenomenon with a positive incision on the trend;

6. Increased participation among workers, and their representatives, most protagonists and active people in the prevention management system;

7. Reducing work-related injury and work-related costs (micro savings);

8. The return on savings on social costs with consequent lightening on public spending (macro saving).

From the use of the application we could achieve "indirect" goals such as:

1. Awareness raising that can deal with work-related accidents;

2. The reduction of work injuries and their absences;

3. Achieving adequate skills to ensure the state of health and to prevent accidents;

4. Achieving greater awareness of the risks involved;

5. Developing a more subtle and accurate critical way of working procedures;

6. A useful conceptual comparison in moments of uncertainty or lack of knowledge;

7. A clear and clear understanding of language problems for foreign workers.

5. Developing a more subtle and accurate critical way of working procedures;

Risk Coverage

Of course, taking into account all possible risks in order to implement possible resolutions is a necessary step:

1. The eventual departure from the project by developers is immediately covered by the entry of new human resources within the team. New contacts will be hired by university environments or private companies. The selected staff will be formed on the project.

2. The coverage of the risk of failure to serve by the user is characterized by promotion campaigns aimed at employers or employees who are in a position of great influence on the workers (end users of the app mobile).

Research Plan and Technical Approach

The surveys have led to the need for users to have an easy-to-use tool at all, and they can provide all basic security knowledge.

Usability is understood as "the ability of a multimedia environment to meet the user's information needs, enabling them to easily access and enjoy content".

The app (**Figure 1**), in fact, speaks the common language, made up of words, phrases and family concepts by following common work, providing information in a logical and natural way.

Figure 1 - Sample screen of the Welcome Icon

All information is easy to find in the graphic interface to increase ease of use. Dialogue with the user is simple and clear. There is also the possibility of improving the system through feedback, which can be sent directly from the app. It aims to make the use as intuitive as possible, believing that the instrument cannot ignore in simplicity and clarity elements that are considered necessary prerequisites. Interactivity is also a determining factor in the effectiveness of the training strategy. The transition from a classical setting of training to new training paradigms through an application requires a reflection on forms of communication.

It is required that the user register on the application the first time it is used.

The user, by entering all the necessary data, creates a personal account, necessary for the operation of internal applications and to ensure the maximum yield of services.

Home, as displayed in **Figure 2,** immediately shows:

• Image and application name;

• Settings and tools buttons;

• Search bar for didactic content for key concepts;

• Selection of didactic content based on training needs (general training for all workers and specific training for neo-workers in the construction sector for the launch version);

• Access / account registration.

Figure 2 – Sample Image of Home

The main service of the application is to provide online educational content to the relevant legislation. Directly from the home, in fact, you can access the educational content useful when working, for immediate training step by step (**Figure 3**).

Figure 3- Sample Image of didactic content of general training

The active participation of the security system through the detection of internal risks specific to the workplace: more detail, application internal pursue the aim of supporting the employer in fulfilling the requirement of prior training, to help trainers in the performance of the training provided, to support foreign workers while minimizing the chances of misunderstanding (**Figure 4**). Use of applications will allow you to quickly consult management and various corporate figures in a corporate private intranet so that you can receive immediate advice from your doctor, employer, or even your supervisor. Will identify specific issues and will set the appropriate measures for an improved workplace security management system. It is hoped that the application of these tools will improve the personal and working conditions of the national

worker and the levels of social integration of immigrant workers who have decided to live and work abroad.

Figure 4 – Sections for active participation

In detail, the descriptions of the functionality of the tools implemented are shown:

- Management training, with which you can schedule training and upgrades.
- Professional CV, with which you will be able to demonstrate, by incorporating your work experience, your skills acquired over time. The most suitable figure will emerge to carry out some rather dangerous tasks based on past experience. Surely a more experienced worker will be more suitable than a beginner worker.
- Accident record, through which you can have a statistical risk assessment. This tool allows to monitor the trend in the accident in relation to the tasks carried out, preparing and sets the

right preventive and safety measures. The worker can acquire knowledge and attention arising from past mistakes in the company so that it avoids.

- Glossary, including definitions, even in foreign languages, of the most common work tools (F screen)
- DPI management, which will handle the individual protective equipment (any wear-resistant equipment held by the worker in order to protect it against one or more risks likely to threaten its safety or health at work.
- Learning Testing, a useful tool for assessing the effectiveness of training activity.
- My Risks: Useful Utility to Define the Intrinsic Hazards to the work environment selectable from a list.

Through the settings icon, you can also: Set the language, reconfigure the account, send feedback, check the info about the currently version of update, and eventually install new ones (**Figure 5)**

Figure 5 – Sample of Setting image

Final remarks

The procedural way to align the pre-defined goals follows the steps and the criteria:

1. Systematic review of literature;

2. App Conceptual Development:

- implementation of the graphical proposal;
- Adaptation to educational content training software;
- Design, programming and development;
- Software prototype development;

3. Implementation of APP :

- Placing on the market through the existing stores (Google Play store, App store, etc.) of the completed application.
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4. Training of Workers and Security Workers Responsible;

5. Final Assessment Phase:

- Testing and monitoring;
- Effectiveness tests.

References

1. La Torre G, Mannocci A, Nicolotti N. Road Traffic Injuries And Deaths On Italian Motorways: are they associated with safety law violations? Senses Sci 2015; 2 (4):126-134;

2. Galeoto G, Sili A, Tamburlani M, Farina M, Mannocci A, Mollica R, Servadio A. Construction and validation of a tool for the evaluation of environmental risks and limitations to the manual handling of loads: cross-sectional study. Clin Ter. 2017 Nov-Dec;168(6):e349-e356

3. Accordo tra il Ministro del lavoro e delle politiche sociali, il Ministro della salute, e le Regioni e le Province autonome di Trento e Bolzano per la formazione dei lavoratori ai sensi dell'art. 37 comma 2 del D. Lgs. 9 aprile 2008, n.81

4. De Felice M. Relazione Annuale 2013 del Presidente Massimo De Felice, Sala della Regina – Palazzo Montecitorio Roma, 9 luglio 2014.

5. Servizio Sanitario Regionale Emilia-Romagna, Azienda Unità Sanitaria Locale della Romagna – Servizio di Prevenzione e Sicurezza negli Ambienti di Lavoro (Dipartimento di Sanità Pubblica) - Staff di Epidemiologia e Comunicazione. Analisi del fenomeno infortunistico nei settori lavorativi a maggiore presenza di lavoratori immigrati, 02/12/2010. Pag. 1:10.

6. Ministero del lavoro. Secondo Rapporto Annuale sul mercato del lavoro degli immigrati. 2012; 119.

7. Price E, Moore G, Galway L, Linden M. Validation of a Smartphone-Based Approach to In Situ Cognitive Fatigue Assessment. JMIR Mhealth Uhealth. 2017 Aug 17;5(8):e125.

8. Pucciarelli G, Simeone S, Madonna G, Virgolesi M. Smartphone use in nursing population: a narrative review. Prof Inferm. 2017 Apr-Jun;70(2):102-115.