

Tutorial Learning and Updating System for PMP Aspirants

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ABSTRACT The Project Management Professional (PMP) certification allows a person to carry out their work and be recognized as a professional project manager. This certificate; also helps to demonstrate knowledge, experience and skills to manage projects and achieve successful skills before employers, clients and professionals in a specific field. This paper aims to develop a tutorial learning system for mobile devices, to be used as a preparation tool for all candidates to the PMP certification with the Project Management Institute (PMI). Thanks to the information and Communications Technologies (ICTs), there are now a number of tools and teaching strategies related to the use of electronic and digital resources (M-learning B-learning, E-learning, etc.) to streamline and make teaching-learning processes more effective. This paper concludes that tutorial-based systems (ST) facilitate the learning process and can turn the traditional educational approach into a versatile, flexible and didactic model.

KEYWORDS project management, M-learning, PMP, tutored learning systems, ICT.

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Sistema tutorial de aprendizaje y nivelación para aspirantes a PMP

RESUMEN La certificación Project Management Professional (PMP) permite a una persona desempeñar su labor y ser reconocida como directora profesional de proyectos; sirve para demostrar a empleadores, clientes y profesionales en un área, que se tiene el conocimiento, la experiencia y las habilidades necesarias para dirigir proyectos y lograr resultados satisfactorios. Este artículo tiene como objetivo desarrollar un sistema tutorial de aprendizaje para dispositivos móviles que sirva como herramienta de preparación a todos los aspirantes a la certificación PMP otorgada por el Project Management Institute (PMI). Gracias a las tecnologías de la información y la comunicación (TIC), en la actualidad existen numerosas herramientas y estrategias de enseñanza que involucran el uso de recursos electrónicos y digitales (*M-learning*, *B-learning*, *E-learning*, etc.) para dinamizar y hacer más efectivos los procesos de enseñanza-aprendizaje. Con el desarrollo de este trabajo se concluye que los sistemas tutorados (ST) facilitan el proceso de aprendizaje y permiten transformar el modelo educativo tradicional en un modelo versátil, flexible y didáctico.

PALABRAS CLAVE gestión de proyectos, *M-learning*, PMP, sistemas tutorados de aprendizaje, TIC.

Sistema tutorado de aprendizaje e nivelção para aspirantes à PMP

RESUMO A certificação Project Management Professional (PMP) permite a uma pessoa desempenhar sua labor e ser reconhecida como diretora profissional de projetos; serve para mostrar aos empregadores, clientes e profissionais numa área, que ela tem o conhecimento, a experiência e as habilidades necessárias para dirigir projetos e conseguir resultados satisfatórios. Este artigo tem como objetivo desenvolver um sistema tutorial de aprendizado para dispositivos móveis que funcione como ferramenta de preparação para todo aspirante à certificação PMP outorgada pelo Project Management Institute (PMI). Graças às tecnologias da informação e comunicação (TIC), na atualidade existem distintas ferramentas e estratégias de ensino que envolvem o uso dos recursos digitais (*M-learning*, *B-learning*, *E-learning*, etc.) para dinamizar e tornar mais eficientes os processos de ensino-aprendizado. Este trabalho conclui que os sistemas tutorados (ST) facilitam o processo de aprendizado e permitem transformar o modelo educativo tradicional num modelo versátil flexível e didático.

PALAVRAS CHAVE Gestão de projetos, *M-learning*, PMP, sistemas tutorados de aprendizado, TIC.

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Introduction

Tutoring systems (TS) are a branch of applied artificial intelligence (AI), which aim mainly to simulate the teaching process carried out by an expert in a particular field of knowledge, both in the mastery of a specific topic and in aspects regarding pedagogy and communication with the user. TS are designed to guide the learning process of a user at any time, in any place, without interacting directly with an expert.

The system presented in this paper was designed to facilitate the teaching - learning process related to the five Project Management Process Groups, namely, Initiating, Planning, Executing, Monitoring - Controlling, and Closing; as well as the ten Project Management Knowledge Areas i.e., Integration Management, Scope, Time, Cost, Quality, Human Resources, Communications, Risk, Procurement and Stakeholders. This system consists of four major learning modules, each one presenting Project Management fundamentals and basic concepts, interactive activities, actual application cases and situational questions about knowledge, interpretation, formulas, specific techniques, and knowledge of the PMBOK. All the foregoing will help as a preparation for the PMP certification exam.

This paper concludes that TS allow the transformation of the traditional teaching - learning model of education, turning it into a versatile, flexible and didactic model for both the teacher and the student, and facilitating the learning process in any field of knowledge.

Objective

To develop a tutoring learning system TS for mobile devices which meets the topics and fundamental theoretical concepts established by the Project Management Institute (PMI), and at the same time is a tool for PMP certification aspirants.

Intelligent Tutoring Systems

The tutoring systems (TS) were first used in 1970 as a way to provide greater flexibility to learning strategies and improve interaction with the user (Aguilar et al., 2011). Over the last 25 years (Corbett & Koedinger, 1997), TS have

provided fertile ground for research in the field of artificial intelligence (AI). The main purpose of the TS is to capture expert knowledge in order to create dynamic interactions with users, thus allowing them to identify their strengths and weaknesses without interacting directly with a human expert (Aguilar et al., 2011).

TS are computer- based teaching systems which have content-based instruction models that specify what to teach and how to teach it (Murray, 2003). These systems can make inferences about the topic domain, in order to dynamically adapt its content, so as to allow students to “learn by doing” in realistic and meaningful contexts, as well as to have more control over their learning (Murray, 2003). The main advantage of the TS, as compared to traditional tutoring systems, is its flexibility regarding their approach and their adaptation to the student. Traditional tutoring systems have a great amount of rules and information, which can lead to confusion (Aguilar et al., 2011).

TS design is based on the fundamental assumption that students learn better in actual context simulations where they are able to use their knowledge, i.e., they learn by doing, making mistakes and building their knowledge (Ferreira & Atkinson, 2009). To sum up, TS have the potential to introduce advances in the field of learning and education (Ramesh & Rao, 2012) and they allow learning to take place at any time and in any place (Kalhor, 2010).

M-learning applications for PMP training: related papers

The searching method used to identify papers related to mobile applications for education and training in Project Management Professionals (PMP) is presented in this section. Detailed research was conducted in the literature, including reviews, articles, conference abstracts and publications on specialized databases.

Articles published in the following scientific journals were also reviewed: Journal of Computer Assisted Learning (JCAL), Computers and Education, Journal of the Learning Sciences, International Journal of Mobile Learning and Organization, International Journal of Computer-Supported Collaborative Learning e International Journal of Learning Technology.

The dates range from 2010 to 2015. A total of 64 papers was reviewed. Fifty-four M-learning

conferences publications and 10 specialized journal articles. The search words used were: Intelligent Tutoring Systems, Project Management Professional, PMI, M-learning applications. Search equations used were as follows:

1. ((TITLE-ABS-KEY (M-learning) OR (mobile learning) AND (((Projects Management professional) OR (PMI)) OR (((Management) OR ((Certification) OR (applications))))) >2009
2. (TITLE-ABS-KEY (M-learning) AND (mobile learning) AND (((Projects Management professional) OR (PMI)) AND (((Management) AND ((Certification) AND (applications))))) >2009
3. (TITLE-ABS-KEY (M-learning) AND (mobile learning) AND (((Projects Management professional) OR (PMI)) OR (((Management) AND ((Certification) OR (applications))))) >2009
4. (TITLE-ABS-KEY (M-learning) AND (mobile learning) AND (((Projects Management professional) OR (PMI)) AND (((Management) AND ((Certification) OR (applications))))) >2009
5. (TITLE-ABS-KEY (M-learning) OR (mobile learning) OR (((Projects Management professional) OR (PMI)) OR (((Management) OR ((Certification) AND (applications))))) >2009

The search results showed that most mobile device applications which help as a preparation for the PMP certification exam only present theory related to the five Project Management Process Groups and the Project Management knowledge areas established in the PMBOK guide. Such applications have no resources or interactive activities that allow users to identify their strengths and weaknesses, and they work exclusively for devices with Android Operating System.

Methodology

The methodology used for constructing "Cyber-PMP" was The Systematic Literature Review (SLR). SLR is a systematic, auditable and organized process that seeks to respond to one or more research questions based on previous publications (Kitchenham, 2004). A SLR is a means of

identifying, evaluating and interpreting all available research relevant and related to a particular research question, or topic area, or phenomenon of interest. Individual studies contributing to a SLR are called primary studies; RSL by itself is considered as a secondary study (Staples & Niazi, 2007). According to Kitchenham (2004), the subsequent stages for conducting a SLR are to be followed:

- *Identification of research*: a RSL aims to find as many primary studies related to the research question as possible, based on search criteria and parameters before making the final selection. The definition of these criteria is the main difference that distinguishes a RSL from the traditional literature review.
- *Selection of studies*: once potentially relevant primary studies are obtained, it is necessary to assess their real quality in order to select the ones that can really help answering the research question(s).
- *Data extraction*: the objective of this stage is to design data extraction forms to accurately record the information researchers obtained from the primary studies. Data extraction forms must be defined when the study protocol is defined.
- *Data synthesis*: involves collecting and summarizing the results of the selected primary studies. The synthesis must be descriptive (non - quantitative). However, it is sometimes possible to complement a descriptive synthesis with a quantitative summary.

The research question considered for this paper was:

P1. What are the main topics, principles and methodologies PMP certification aspirants should know and master?

The search words used were: *Intelligent Tutoring Systems, Project Management Professional, PMI, M-learning applications, PMP*. Additionally, these words were mixed together in order to perform other searches. The search equation used was:

(1) TITLE-ABS-KEY (ITS, Project Management Professional, PMI, M-learning applications PMP) AND PUBYEAR > 2009 AND (LIMIT-TO (SUBJ-AREA, "BUSI") OR LIMIT-TO (SUBJ-AREA , "ECON")

The publication dates considered in the state of the art review range from 2010 to 2015. A total of 22 publications was collected including articles, conference papers, abstracts, book chapters and articles in development. The number of publications collected by type in the review of the state of the art is presented in Table 1.

TABLE 1. Number of publications by type

TYPE OF PUBLICATION	QUANTITY
Articles	13
Conference Articles	5
Book Chapters	1
Books	1
Abstracts	2
Total	22

Source: Authors.

A search of gray literature was additionally conducted; 17 manuals and 12 electronic booklets on project management and administration were collected. This literature was published by the Project Management Institute (PMI), *Escuela de Dirección y Administración de Proyectos (EDAP)* and *Escuela de Ingeniería de Antioquía (EIA)*; and it was used to build the Tutoring System knowledge base (KB) herein.

“Cyber-PMP” was developed with the XOT software, which provides a comprehensive set of open source tools for developers and creators of interactive learning material (Xerte, 2015). This software has been designed for developers of interactive e-learning content and it allows to create rich content with some scripts (Xerte, 2015).

TABLE 2. Knowledge Base (KB) Contents

TYPE OF PUBLICATION	KNOWLEDGE AREAS	TOOLS
Fundamentals	Integration	Gathering information
Initiating	Scope	Performance’s monitoring and controlling
Planning	Time	Schedule development
Executing	Cost	Time and cost estimation
Monitoring and Controlling	Quality	Prioritization
Closing	Human Resources	
	Communication	
	Risks	
	Stakeholders	
	Procurement	

Source: Authors.

Application case

The development of a Tutoring System (TS), which would strengthen and consolidate the basic knowledge set out in the PMI guidelines, was considered necessary due to the large number of issues PMP certification aspirants must know and master. This system presents real cases that give users the opportunity to demonstrate their experience, skills and mastery of the project management’s key topics, considering that the subjects in which aspirants have more difficulties when taking the exam are related to situational questions involving decision making. “Cyber-PMP” allows the user to acquire the basic knowledge included in a preparation course for the PMP certification, regardless of the user’s discipline and level of education.

Main elements of “Cyber-PMP”

Knowledge Base (KB): It gathers all information about the basic concepts of project management, process groups and knowledge areas (Inputs, Tools and Techniques, Outputs). “Cyber-PMP” knowledge base (KB) contents are presented in Table 2.

“Cyber-PMP” Operation.

“Cyber-PMP” works for mobile devices with Android and iOS operating systems with access to the Internet. It can also be used in personal computers and laptops. It can be accessed from any browser (Google Chrome, Mozilla Firefox, Opera, Safari, and Internet Explorer). The mobile device

or computer must have Adobe Flash Player version 11.1 installed. Use the following link to access “Cyber-PMP”:

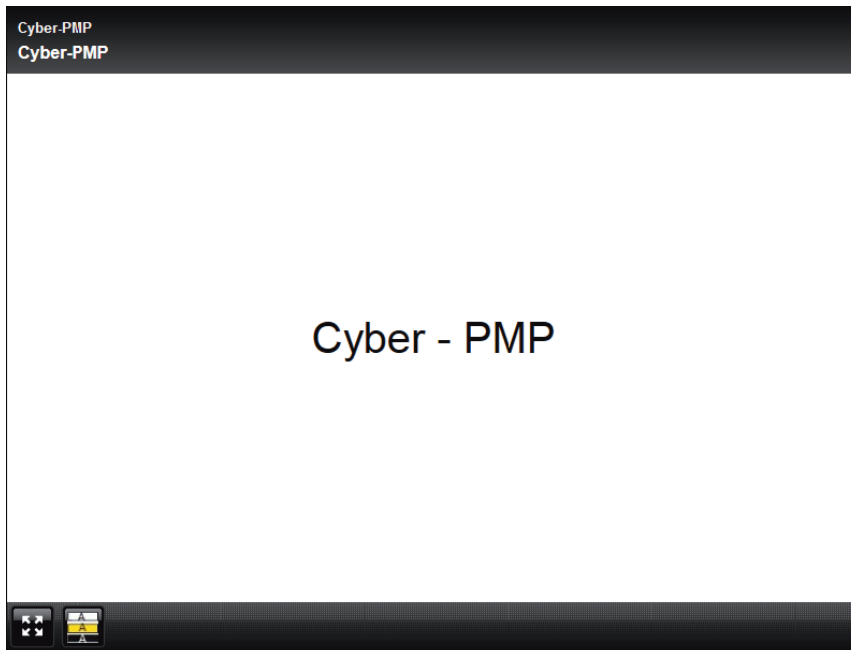
<https://www.dropbox.com/sh/gd4nfinco9xusph/AAB8PJlwtVhc6VKdWgKlplqa?dl=0>

The user must extract the contents from the previous link and run the file named “index.htm”. Once the system starts, the user has to select the process area they want to know: initiating, planning, executing, monitoring and control, or closing. Depending on the selected area, “Cyber-PMP” subsequently presents each of the ten knowledge areas, for the user to select one. Each

of these areas has the concepts and fundamental notions (inputs, tools and techniques, and outputs), a series of activities which aim to assess the level of mastery of the topics proposed by the system, and a test that brings together different types of questions allowing the user to know which aspects must be reinforced in order to achieve a good level of performance in the Project Management Professional PMI (PMP) certification exam. The system’s initial screen is presented in Figure 1.

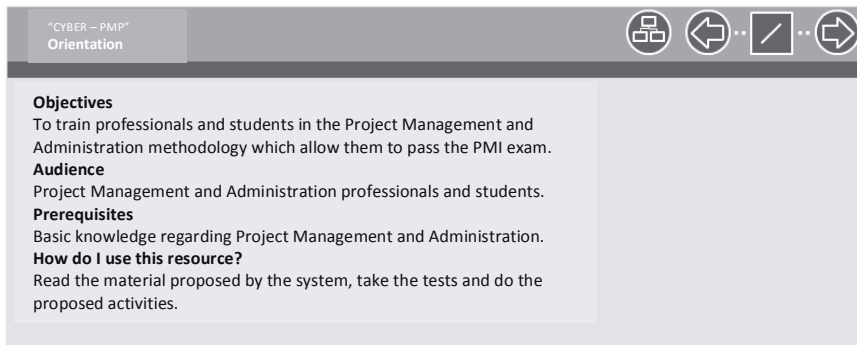
The second system interface is shown in Figure 2. “Cyber-PMP” objectives, its target audience and how to use it are specified therein.

FIGURE 1. “Cyber-PMP” Initial interface



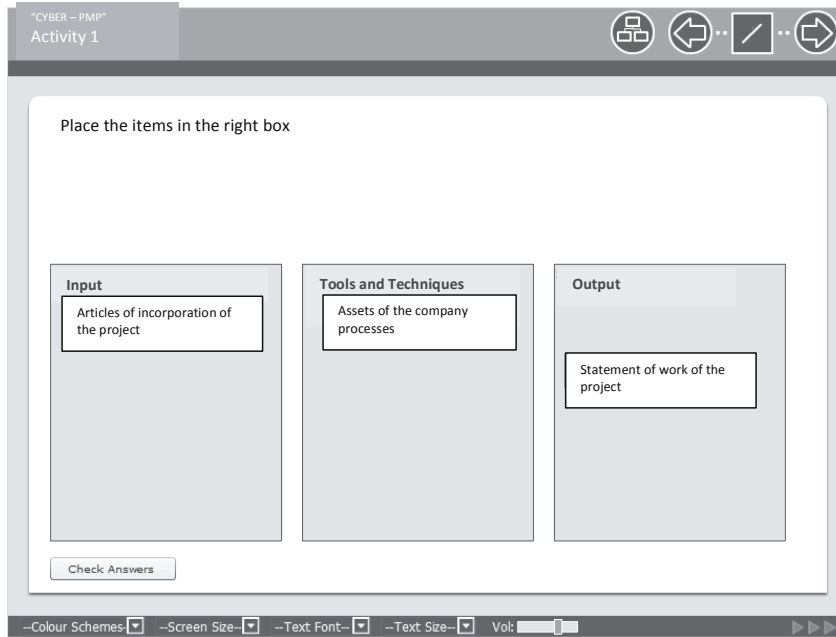
Source: Authors.

FIGURE 2. “Cyber-PMP” Second interface



Source: Authors.

FIGURE 3. “Cyber-PMP” Activity 1



Source: Authors.

The first activity proposed by the system is presented in Figure 3. This activity is part of the first group of knowledge (initiating process) and the first knowledge area (Project Integration Management).

Conclusions

Tutoring systems (TS) facilitate the learning process in any knowledge area, as they have the ability to provide individual feedback and instructions to users in real time, without the intervention of a human expert. Furthermore, they allow the transformation of the traditional teaching - learning model of education, turning it into a versatile, flexible and didactic model for both the teacher and the student.

PMP certification can become a differentiating factor when applying for jobs related to project management due to the high demand for specialized project managers nowadays. For this reason, the use of learning tools for mobile devices for this particular matter constitutes a competitive advantage for PMP certification aspirants, as it can be used at any time, in any place, optimizing time and resources.

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