Original Research Paper

Information Technology

INFORMATION TECHNOLOGY COMPETENCIES: A STUDY OF ITS INTERNATIONAL APPLICATION FOR CURRICULAR DESIGN IN HIGHER EDUCATION

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ABSTRACT Innovation in curriculum design has evolved towards a competency-based approach. On this context several institutions in North America and Europe have proposed series of curricula for information technologies (IT) competences. Based on those approaches a research was convey for designing a new educative program of Bachelor in Arts in Digital Business Management in Mexico. In conclusion, was found that these IT competencies models are highly applicable for curricular design, to conform IT professionals for the current international markets.

INTRODUCTION

Curricular guidance has been a common requirement in a competency-based approach for programs in Information Technology (IT) for fulfilling and identifying the body of knowledge as a set of student learning outcomes that constitute core IT competencies for all IT-related professionals. According to Díaz-Barriga and Rigo (2000), the competence-based approach has been implemented since the late 1960s, but it is in this 21st century that it has become predominant in educational sector. On the context of IT competencies, several institutions in the European Union (EU) and North America (US) have proposed series of curricula. Based on those approaches a research was convey for designing a new educative program of Bachelor in Arts in Digital Business Management in Mexico.

The first IT model analyzed was the European e-Competence Framework (e-CF) version 3.0, which provides a reference of 40 competences as applied at the Information and Communication Technology (ICT) workplace, using a common language for competences, skills and capability levels. In 2016, the e-CF became a European standard and was published officially as the European Norm EN 16234-1. As the first sector-specific implementation of the European Qualifications Framework (EQF), the e-CF fits for application by ICT service, user and supply organisations, multinationals and SME's, for ICT managers, HR departments, higher education and private certification providers, for market watchers and policy makers, and other organisations in public and private sectors.

The second geographic area studied was North America, where the U.S. Department of Labor developed an Information Technology Competency Model made by the Employment and Training Administration (ETA) working together with industry leaders to represent the technical competencies required for success in the IT industry. Also in US, the Association Computer Machinery (ACM), has proposed curricular innovations that for several years have been taken into account for international educational markets in some countries. These professional competences have also served as the basis for international IT assessment with exams as the General Record Examination (GRE) applied globally by institutions as the Educational Testing Services (ETS).

An example of IT basic competencies is presented by Figure 1, which shows the IT fundamentals according to ACM (2008).
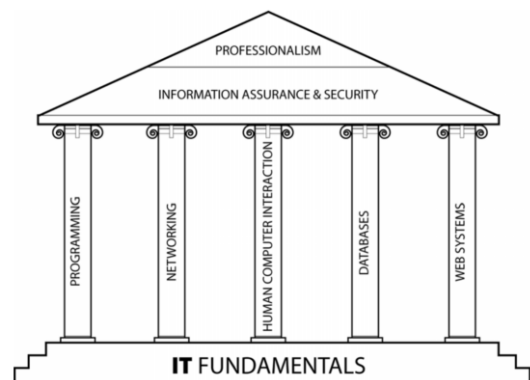

Figure 1: IT FUNDAMENTALS
Source: ACM (2008)

CASE STUDY

In the present study, based on EU & US competencies models, it was designed a new educative program of Bachelor in Arts in Digital Business Management in Mexico, to investigate international application of IT competencies for curricular design in higher education. Based on those international competencies in IT, within the context of e-business development and the advancement of e-commerce in Mexico, the University of Colima designed the new career, whose curricular competencies proposed the implementation of learning strategies based on integrative projects, developed by links with productive and social sectors.

This design takes into account key competences proposed by European e-Competence Framework (e-CF) version 3.0, and the US models, which are considered a global requirement for a degree in the area of IT worldwide. US and e-CF models facilitates implementation of curricular developments, at the level of general contents, and on specific aspects of evaluation with rubrics that take into account the levels of thought that students must develop. These competencies are proposed through integrative projects, beginning from concepts and advancing through creativity. This way students must apply their meta-cognitive capacities: synthesis and critical self-evaluation considering global IT trends. These learning outcomes are created with the intent of

being adaptable, not overly technology specific, and to remain current for the foreseeable future. Furthermore, these core IT learning outcomes were primarily influenced by current and future needs of business and industry, professional and industry certifications, government and standards bodies, and related-IT curricula, including the ACM/IEEE-CS Curriculum Guidelines for Undergraduate Degree program in the U.S. as well its similar bodies in Europe for IT Competency Model Design.

E-business and the internet of things (IoT) drive curricular innovation based on new market trends and the need for e-business management professionals. According to a study carried out by Euromonitor International, from 2010 to 2016 the growth of e-commerce worldwide was doubled and Latin America is also a region with high growth rate. In addition, by 2020 e-commerce trade is expected to grow two times faster than traditional trade, which explains educational market interest in digital businesses (Delta, 2017).

IT Higher Education Market in Mexico

Mexico National Association of Institutions for Education in IT is the ANIEI, which proposes curricular design with professional competences also used by its National Testing Center CENEVAL, in designing its general exams for IT degree: EGEL in Informatics. ANIEI and ANFECA are institutions whose objectives are to contribute to raise the academic level in the preparation of their students, by establishing curricula and collaborating in their implementation, as well as to promote activities aimed at unifying criteria among the institutions they associate. Its guidelines were also considered for curricular design of the new program in Digital Businesses.

Development of abilities according to Bloom taxonomy
Assessment of learning outcomes covers three levels of the revised Bloom taxonomy, so that an evaluation rubric can be constructed and applied that provides clear and measurable metrics. This is shown at Figure 2.
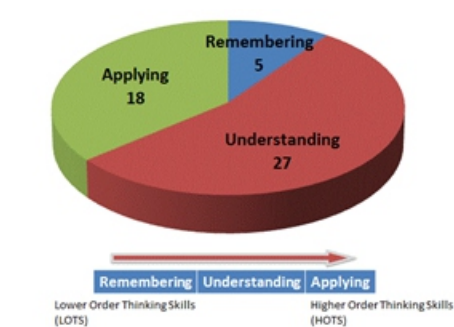

Figure 2. Bloom Taxonomy covered Skill Levels
Source: ACM (2014).

APPLICATIONS OF IT COMPETENCIES FOR CURRICULAR DESIGN

Developing countries

Research on competencies based approach– such as IT curricular design – has been carried out for several countries worldwide in order to examine the potential utilisation of international IT competencies. This study deals with EU & US models and both have shown its applicability for curricular design on IT competencies in developing countries as Mexico.

In the present study, the higher education system in Mexico has applied with certain success international IT competencies models, which have been adapted considering its own particular requirements. These conclusions are presented as follows.

CONCLUSIONS

As results of the survey of IT competencies in Mexico, in particular was found that:
1. Organisations needs to detect and evaluate under a systemic approach opportunities for improvement through IT projects for

increasing its competitiveness: Private sector requires the implementation of IT for administrative and accounting processing (EDI), Customer Relationship Management (CRM), and Enterprise Resource Planning (ERP), under modern methodological approaches.

2. Organizations require certified human capital to apply international knowledge in an independent and innovative way in the search for business solutions, with responsibility and social commitment.

Finally, as an overall conclusion of the present paper, was found that international IT competencies -such as EU & US models- are highly applicable for curricular design, to conform IT professionals for the current international markets.

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