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AN ANALYSIS FRAMEWORK FOR DEFINING THE REQUIRED IT&C COMPETENCIES FOR THE ACCOUNTING PROFESSION

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ABSTRACT

In the current economic context, the issue of IT&C competencies indissoluble to the accounting profession gets special meanings: accounting skills and those associated with the quality of professional accountant must be completed with the specific use of advanced technologies to address this profession. This paper proposes an analysis of key competencies concerning the use of information and communication technology by the professional accountant, by defining a multidimensional analysis framework following, from different perspectives considered to be essentials, the opportunity to include IT&C competencies into training and professional development programs for accountants and auditors. This framework captures IT&C competencies located at the intersection of three axes (Roles, Levels of experience and Information technologies) that will guide the definition of thematic areas and specific competences. Finally, we identified correlations between the IT&C competencies and some important information technologies addressing the training programs for the accounting profession at different levels of expertise.

 *IT&C competencies, skills, knowledge of IT, IT technologies, accounting profession*

JEL code M40, I21

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INTRODUCTION

In the actual economical context, every entity is trying to rediscover itself, in order to define new coordinates in the process of restructuring and adapting to the new requirements imposed by the new realities with which the economic environment is confronted in the present. Technological proliferation and, especially, information technology proliferation has led to requirements of the work market that are more and more diverse in relation to the competencies of the accountant as a profession.

The problematic of the competencies and their evaluation has become a subject of major interest in the professional educational preparation in any field. The term competency has a major impact also in the accountant education, with a powerful influence upon the way the future accountants will be evaluated. A fundamental characteristic of the competencies-based education is that the definition of offer and of the educational program starts from the purpose of obtaining certain results identified beforehand.

Discussing in terms of efficiency of the accounting profession as a central and centralizing element of a business, the economics and business environment accepts the professional qualification of the members of the accountant body as being acquired in accordance to a performance standard expected by employers in all the specific fields. The approach based on competencies represents a systematic and efficient manner of accomplishing this goal.

By competency we understand the ability to complete the tasks and the acts attributed to professional accountants (the newly qualified accountants as well the experienced ones) according to the standards demanded by the employers and general public. The reputation, the value and significance of the accounting profession depend on the ability of their members to answer to the expectations of the organizations that they are working for, through providing adequate services which bring added value in a certain time window. Lately, the academics environment as well as the business environment has reached a common conclusion in which concerns the teaching of the accountants, in general, but more precisely, the experts in this field: a separation cannot be made between the knowledge and the gathered experience in the field of accounting and in the fields associated to the information technology domain. The accounting competencies and those associated to the quality of professional accountant must be completed with those specific to the advanced use of technologies that are related to this field. Following the same idea, bodies and communities of accountants have constantly and continuously supported the need for change of the education in accounting through the growth and improvement of the knowledge regarding information accounting systems or the techniques and the most frequent practices that concern the application of the advantages of instruments specific to the information technology in the activities the accountant performs.

The present paper wishes to answer to the following questions: Which should be the competencies from the Information and Technology Communication (IT&C) field indissoluble to the accounting profession? and how can these competencies be analyzed with respect to the existing information technologies in the present time and keeping track of the parts played by the accountant with respect to the internal environment of an organization but as well to the interaction with the external environment?

1. RESEARCH METHODOLOGY

The present paper proposes an analysis of the main competencies that target the professional accountant regarding the usage of information and communication technology in his activity, by defining a multidimensional analysis framework which supervises, from a series of perspectives considered essential, the opportunity of including the IT&C competencies in the education programs and the professional development of the accountants and the auditors.

The present paper follows the authors concerns from the research point of view regarding the discovery of new methods to align the competencies associated to information technology to the requirements imposed by exercising their profession as accountants inside the organizations. In the step towards the definition of a coherent analysis framework for the educational necessity described through efficient formation programs based on identifying competencies requested in order to practice the accounting profession, there have been analyzed several relevant opinions from the specialist literature, as bedrock on which the proceeding of the research is based, following at the same time the way in which these converge to the purpose of the present paper. In the end, correlations have been identified between the identified competencies and the existing information technologies that can answer to these competencies through their inclusion in the framework of the formation programs in the accounting field on several levels of experience.

2. LITERATURE REVIEW

Literature review had the purpose of identifying the ways in which the issue of the topic discussed was previously addressed, but to identify also the amount of interest raised by the competencies in IT&C in the field of education at different levels but also in the business environment, as a recipient of the product of accounting training.

A large number of professional organizations have stressed the importance of introducing information and communication technology in the subject areas specific to accounting education. Even since 1993, The Association to Advance

Collegiate Schools of Business (AACSB) stresses the need for complete knowledge of accounting professionals with specific tools and techniques of information technology (AACSB, 1993). Similarly, The Institute of Management Accountants (IMA) places competencies in the field of use and exploitation of information technology (in terms of knowledge, skills and techniques learned) among the top 10 accounting profession skills required (IMA, 1996). Also, The American Accounting Association, in a report aiming at a target group of accounting faculties, suggests completing learning techniques with informatics tools of professional training assistance (AAA, 1986).

As shown in the official views expressed by the Commission of changes in accounting education - The Accounting Education Change Commission (AECC), "because organizations are affected by rapidly growing dependence on technology, professional accountants should understand current and future roles of the information and communication technology in organizations " (AECC, 1990). The American Institute of Certified Public Accountants (AICPA) suggests as primary the need to complete the knowledge of individual professional accountant with the skills and competencies necessary in order to use effectively and easily the computer tools that are suitable for this area (AICPA, 1998).

IFAC has stressed very concise the need to complete the accountant education with information technology, through the educational standard IEG-11 International Education Guideline on "IT and Accounting Curriculum": "Information technology is universal in the business world. Competence with this technology is imperative for the Accounting Profession "(IFAC, 2003). The understanding of educational needs in this area should be seen in terms of the need to adapt to the new challenges, techniques and opportunities of development of the accounting profession. Involvement of the IT component in this education requires a shift in the accounting thinking and the specific actions towards improving the activity efficiency through automation and computer assistance.

The collection and growing of IT&C skills by the professional accountant may be justified at least through the level of expertise required to use financial and accounting informatics systems, but also with the tools that enhance the ability to make decisions in an environment that is increasingly computerized. This relationship is demonstrated by research based on various empirical studies (Eliot, 1992; Cooper, 1996; McKinnon & Bruns, 1992; Borthick, 1996) emphasized the idea that managers generally rely on skilled accountants to obtain information from disparate sources and on analyzing them in a useful and understandable manner.

Chen *et al.* (2009) were concerned in identifying the key knowledge necessary for the accounting profession after completing a training and refinement program in the field. A number of other reference papers treat in depth the topic of IT&C skills required for the accounting profession, through empirical studies conducted on different populations, or only through studies at a conceptual level, emphasizing

the usefulness and necessity of acquiring skills in the IT&C domain for exercising the accounting function (Harrison *et al.*, 2004; Wessels, 2005; Cardoso, 2011; Ku Bahador *et al.*, 2012; Havelka & Merhout, 2009).

In the research topic of implementing training programs that would take into account the need for symbiosis between information technologies and accounting when speaking of professional accountants training, there can be identified several specialized studies designed to emphasize the main themes that could be a common body of knowledge necessary to the professional regarding the obtaining of competencies in the use of IT&C (AAA, 1986; Daigle, 2007; Borthick, 1996). Besides these, other possible proposals can be found regarding learning objectives and possible training activities related to the IT&C component of the training necessary for the professional accountants (Heagy & Rakow, 1991; Jackson & Cherrington, 2002). All these studies highlight the main issues related to the accounting training in the field of informatics systems that should be included in any training program: business cycles, control and auditing, analyzing and designing of the financial-accounting system (Jackson & Cherrington, 2002). Based upon the recommendation of IFAC, Wessels (2008) proposes a series of strategies for the implementation of IT skills in the education of professional accountants.

Looking at it more pragmatically, Novak and Beckman (2008), define a multi-layered model for improving the knowledge of an organization, through a skill based approach. The authors underline the idea according to which IT&C represents an activator factor in the retention of organizational knowledge (and implicitly associated to the accounting profession), the usage of information technologies leading to the organizational memory growth of an enterprise.

Following a review of the literature on IT&C technologies applicable to the accounting profession, Wessels (2005) analyzed the results of research conducted by Greenstein and McKee (2004) and Theuri and Gunn (1998), along with the proposals set out by IEG 11 issued by IFAC (2003a). Thus, in a first step the author noted 22 major IT technologies important for the accounting profession, only to later recommend 36 critical technologies in conducting of daily work tasks of the professional accountant, and also in the process of innovating and creating new products through the IT&C component.

Even though there are several specialist studies trying to prove the necessity of completing the training programs in the field of accounting with disciplines orientated towards gaining IT&C competencies, we could not identify a coherent analysis framework of these competencies against the demanded expertise level and accordingly to the parts played by the professional accountant inside and outside of the organization in which he performs. Also, there are no studies to present the need for the implementation of a training program at a national level following the IT&C skills associated to the accounting profession in Romania,

taking into account the IFAC recommendations through its broadcasted standards and proposals regarding the homogenizing of knowledge and competencies in the field.

3. THE ANALYSIS OF THE ACTUAL STATUS OF PROFESSIONAL ACCOUNTANTS TRAINING THROUGH THE IT&C COMPONENT

The accounting profession, viewed traditionally, is subject, in the present, to some threats coming from the emergence on the labor market of new categories, not specialized in accounting, but with university and post-graduate studies and mastering very well the IT field. Non-specialists in accounting may be able to develop internal analysis of data from the available information sources of the organization. It was found that these competitors are sometimes preferred by the accounting firms. If non-accountants learn to respond better than professional or authorized accountants to the management information requirements issued by an organization, it can be deduced very simply, that the value of the accounting profession falls within that organization. Interpretation of accounting information significance, and ensuring the completeness and the integrity of it, is a task that falls, however, to the accounting profession. This creates an opportunity to prepare accounting professionals today given the specifics of the work done by them: accounting, control, auditing, and so on, in a computer-intensive environment – environment about which Siegel (1996) stated that “creative analysis is more valuable than encyclopedic knowledge specific to accounting procedures.”

3.1. The need of IT&C component for the professional accountants

The role of the accountant follows the same trend as for the other professionals from business, recording a major change oriented towards technology. After completing a training and refinement program in the field, the accounting professionals expect to know the use of spreadsheets in financial analysis, business graphs construction and interpretation, word processing, how to make a business presentation or one on the financial-accounting statements, the use of tools to assist in auditing, financial reporting, and so on, business systems, databases management systems or using communication solutions in a virtual environment, at an advanced level (Chen *et al.*, 2009). They are anticipating, also, skills in evaluating IT security needs at the organizational level, in the organization and management of computing resources within the enterprise where they evolve, along with protection against unauthorized access to or against vulnerabilities concerning the IT&C environment of the organization. Once aware of the need to adjust the accounting profession in order to accept and adopt evolutionary computing environment from the business field, the training of the experts in this field must be concerned, equally, and about gaining the IT skills (expressed in terms of knowledge, technical skills and abilities).

3.2. Complementarity between IT&C competencies and those associated to the accounting profession

Lately, we are witnessing an expansion of the accounting part inside an organization, the latter evolving from supplying financial information to seconding the business decision, becoming a component part of the organization's management structure. The accountants have changed their priorities from the analysis of past events to acting as strategic partners, advisors and providers of financial-accounting information. The Institute of Management Accountants (IMA, 1996) has identified four activities that define the present accounting profession: long term strategic planning, internal advisor, information systems and computer operations, and the improvement of business processes. We can admit that the accounting profession is a supplier of not only financial information, but technological and strategic also, at any organization's level.

Information technology has completed the professional accountant mission, who does not only uses the information system through exercising his given part, but starts to play a growing part in determining the design and realization requests of such a system, in all the stages it goes through, and of the evaluation of its functionalities, or in knowing and using some information technologies that help him exercise his functions as economist, manager, auditor or evaluator, in certain stages of his career.

The role of the accountant changes continuously while the world becomes more and more information and technology oriented. As technology continues to have a major impact onto the way to lead a business, the inclusion of IT&C in the education and in the teaching of the accounting profession, at any level of preparation, proves to have a critical importance for any institution of formation in this field.

The professional accountant will be asked to provide a wide variety of services based on software applications, together with the involvement in activities that regard the information system of an organization: the information system analysis, the information management, the information security and so on. Analyzing this aspect, we can observe the need of a high enough level of knowledge of the IT aspects: the professional accountants have to not only be acquainted with techniques of using software applications, but must show a good understanding of the fundamental concepts associated to the term of financial-accounting information system, in all its life cycle stages, and furthermore they have to demonstrate a high level of experience when it comes to using IT instruments associated to the status of economist in general. In an article presented in the journal of the body of professional accountants from the US, Albrecht and Robert (2001) foretold that the demands for advanced IT competencies, explained through the need of involvement of the accountants in issuing judgments based on the analysis of information, will become a critical point in the future. Analyzing the

expansion trends of the information technology towards more and more professions from the economical field, we can say for sure that the forecast could have been extended to activities that target an entire business, from the operational level to the management level, but, with a majority, it has been confirmed mainly for the accounting profession.

The globalization has represented the phenomenon that led to a harmonization of practices, of standards and professional qualifications in the accounting field. With the globalization of markets, there was an acute need for professional accountants with specific skills and abilities who can perform specialized tasks in different jurisdictions. This exchange of professional accountants across countries requires not only mastering of the international accounting norms and standards in this area, but also of a number of business tools currently used extensively. Information technology has proven to be an indispensable and activating factor for the implementation of these tools in an efficient manner.

3.3. The analysis of IT&C competencies usage against the functions at organization level that concern the accounting profession

Today the information systems have become an integrated part of any activity performed within the organization. Given this feature, the usefulness of IT&C knowledge has become a *sine qua non* condition for professional accountants.

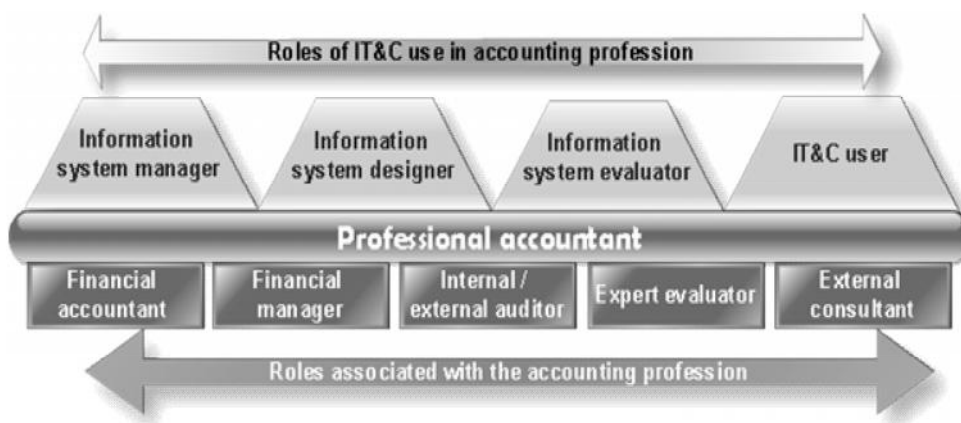
Over time, accounting education has continued to be quite limited, focusing on practical accounting skills (Boyce, 2004). Delmond and Lebas (IFAC, 1998), cited by Wessels (2005) reinforce this claim, arguing that the role of the professional accountant was constrained to that of reviewing the financial data of an organization, detaching him as important in decision making.

Traditionally, the professional accountants have been called in functions such as: *chief accountant, financial manager, financial or operational internal auditor, external auditor or external consultant*. Current developments in the business environment have led to a natural change of the role of the professional accountant so that today his abilities are not just those of user of information and communication technologies (IT&C), but rather he can play an important role in an evaluation team, design or management of information systems.

In the vision of the IES 2 standard (IFAC, 2003a:44) “all professional accountants are expected to participate in at least one of the ***roles of manager, designer or evaluator of information systems***, or, a cluster of these roles”. These generic roles do not demand the professional accountant to be an expert in the IT field, but rather we can state that it proposes the development of a set of abilities and basic competencies in the IT field that can help in securing decisions, in the identification and evaluation of new opportunities and risks generated by the IT component at the organizational level, the usage of the informatics instrument in completing daily tasks for the business activities. Clearly, one must not ignore the

fact that there exists a **golden rule**, stated Druckman (2008), when we analyze the performance of the professional accountant, especially at the mid organizational level, there were in practice they play various parts at the same time – „*their competencies must answer to the organization needs*”.

Figure 1. The functions of the professional accountant
in the organizational environment



4. DEFINING A CONCEPTUAL ANALYSIS FRAMEWORK FOR COMPETENCIES IN THE IT&C FIELD FOR THE ACCOUNTING PROFESSION

The conceptualization of the term IT competence in the accounting profession requires, first, to highlight the meaning of the term competence in general. As it is presented, the basic psychological theory designates the correlation between skills, attitudes, knowledge and habits that enable a person to work effectively in a great variety of situations and which helps the person carry out his role. In the training based on competence the defining three factors (knowledge, attitudes and skills) have to be managed effectively and in an integrated manner so that they can lead to performance and success.

Associated with the term professionalism, competence may designate the group of knowledge, attitudes and skills that affects a major part of a person's activity, is correlated with performance in the activity, it can be measured by generally accepted standards and it can be improved through training and development (Lucia & Lepsinger, 1999:2). All three elements combined give the individual the opportunity to excel in a particular field. The latter sense may be found usually in management and focuses on cultivating the three elements (knowledge, attitudes and skills) to the level of excellence through various programs and courses using learning methods and techniques adapted to the subject in discussion.

Under the general international education standards for the accounting profession, IFAC defines competency as the ability of the individuals to meet the expected standards of the accounting profession, fact which requires an adequate level of knowledge, skills, values, ethics and attitudes to build and develop those skills. Appropriate level of competence will depend on certain factors, such as the complexity of the working environment, the complexity and type of tasks to be solved, the required expertise knowledge, the dependencies related to teamwork, the level of autonomy, or the level of analysis required. (IFAC, 2009).

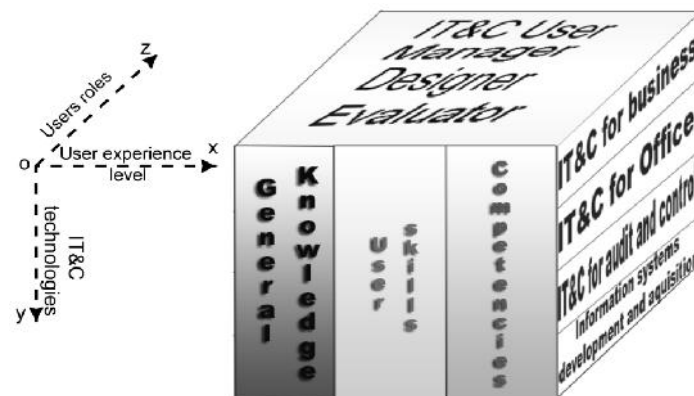
While the attitudes are related to the individual's personal characteristics, the skills and the knowledge are the two aspects that accounting education should be based on when defining the appropriate training programs. Often accounting training at an advanced level requires a distinction between the concept of competence and that of knowledge when developing the professional accounting skills to deal effectively with the tasks assigned to him in the exercise of his roles. Awareness of differences in educational goals related to the development of knowledge and to those related to competencies (Carter, 1985) has become essential in designing effective training programs by the preparation institutions of professional accountants (Stone *et al.*, 1996). In the context of vocational education, knowledge is assimilated to the state of holding relevant information in a particular context, while the ability (the one that is closest to the meaning of the term competency viewed from a practical standpoint) is seen as the ability to use the knowledge in the process of performing a task. The competencies can be identified on multiple levels (novice, beginner, practitioner, expert, professional), while the knowledge in a certain field can be considered as having a dichotomous character (present or absent). In the vocational development of a person, the relation between knowledge and competencies goes both ways: the competencies cannot exist without the due knowledge, while the knowledge is considered necessary (but not sufficient) for competencies. The accounting teaching based on knowledge is preoccupied, in general, with the development of skills for the target group, which concern gathering as much information as possible which is associated to some specific concepts and scenarios. The training that relies on obtaining and growing competencies (viewed from the point of view of abilities and habits) aims at the ability of using the various concepts gained through enhancement of knowledge during specific tasks carried out and at the increase of the capabilities to apply abstract principles in solving some specific problems (Angelo & Cross, 1993).

For many analysts, today's training of the accounting profession focuses on the acquisition of knowledge and it is only tangentially addressed to acquiring and cultivating the necessary competencies in relation to the real needs imposed by permanent changes in the business environment. The need for accounting practitioners at an advanced level of expertise transcends, therefore, the limit of the knowledge based education, requiring the orientation of the training process in this field in the direction imposed by today's reality. This designates a recalibration of

curriculum and curricular areas after an analysis of the necessary competencies. Competency levels should also be carefully analyzed in designing any training programs on the acquisition of skills and knowledge, and techniques and learning methods can be built upon this hierarchy.

In the process of identifying the competencies that a professional accountant must possess in the field of information and communication technology (IT&C), we propose a general analysis framework based on a structure that defines the dimensions according to which the term of IT&C competency can be addressed. This framework captures the IT competencies located at the intersection of three main axes that will guide the process of definition of thematic areas and areas of competence. The three axes, together with a three-dimensional representation of their components, can be observed graphically in Figure 2. Thus, the IT&C competency necessary for the accounting profession will be analyzed in relation with the part played by the accountant user within the organizational informatics system, with his level of expertise in manifesting the competency and in relation with the training modules destined for education with the purpose of acquiring the identified IT&C competency. The competency identification must be followed, usually, by its description through a list of thematic and content courses, the success in defining these being a direct consequence of identifying the best combination of values among the three vectors in relation with the competency's need.

*Figure 2. General analysis framework of the ICT competencies
in the accounting profession*



Even though the level of experience vector can present multiple levels of detail in relation with the perceived IT&C competency importance in the performance of the professional accountants, the proposed framework limited itself to evaluating the necessary experience level over three levels of hierarchy:

- general knowledge – the individual knows the general aspects and specific basic concepts and he is capable of realizing certain

correlations between the identified problems and these concepts, implying a somewhat cognitive activity which will allow him to act effectively in certain situations;

- ability in usage – the individual manages to carry out a certain task through the use of necessary knowledge previously acquired, acting aware through applying some defined plans on a certain time window by following precise goals;
- competencies – the person manages to build the solution of any problem, exhaustively analyzing the situational components and acting with conviction, guided by experience and by the intuitive comprehension of the details of the problem and of the scenario in which the problem appears.

In defining the transverse axis of analysis of IT&C competencies there have been used the roles defined in the educational standard IES 2 (IFAC, 2003b) on the use of information systems and, by extrapolation, of the information and communication technology: the user role, that of manager, of designer and that of evaluator. Grouping competencies over these types of functions is guided by the need to correlate competencies with the designated responsibilities in relation to ensuring the accuracy of financial-accounting information obtained by using the IT&C component.

The vertical axis proposes identified competencies evaluation in relation to the educational training modules. These were defined on the basis of the main responsibilities of the accounting profession, expressed through associated activities. Placing a competency in agreement with a training module is a prerequisite for defining an educational offer that is consistent with the real-world usage needs of concepts, methods, techniques and IT tools in the accountant activities, on all three fundamental levels of the organizational pyramid: operational, strategic and management. Defining an educational offer must detail the content areas of the training programs in the field, which need to match those relevant from the competition.

The three perspectives of the analysis converge each time to a certain key point in which the IT competencies destined to the accounting profession are explained through function descriptor, through the appropriate level of training for that function and through the educational offer (defined through curricular fields with certain study disciplines) necessary for assimilating and developing the concerned competency.

**4.1. The dimension of IT&C specific competencies that target
the accounting profession**

*Table 1. Dimension of general competencies needed for information
and communication technology usage*

| | | | |
|--------------------------------------|---|---|---|
| IT&C General knowledge | <ul style="list-style-type: none"> • IT Strategy • IT architecture • The IT impact on the business process • Information systems development process or IT&C acquisition process • IT&C management • Business communication by the means of IT&C use | <ul style="list-style-type: none"> • IT control standards • IT control objectives • IT control environment • Roles and responsibilities • IT risks assessment • IT&C risk treatment • It control activities • Monitoring IT&C control compliances | Knowledge associated with IT&C control |
| IT&C control competencies | <ul style="list-style-type: none"> • The methods selection for assessing IT&C control • Assessing the IT&C control environment • Assessing the IT&C control in the Information Systems developing / acquisition process • The IT&C risks analysis and assessment • IT&C control evaluation • The evaluation of IT&C control monitoring. | <ul style="list-style-type: none"> • IT&C business and accounting systems • IT&C integrated systems for business management (ERP, SAP, CRM) • Ensuring security organization assets. | IT&C use competencies |

(Adapted from IFAC, 2003b)

Regarding IT&C competencies relative to the accounting profession, the IES 2 (IFAC, 2003b:44) standard groups them into several key areas:

- General knowledge about IT.
- Knowledge about the control in the IT field.
- Competencies (practical skills) in IT control.
- IT user competencies.
- A competency or a group of competencies associated to the functions of manager, evaluator or designer of SI.

These fields can be detailed, further, into main areas of content specific to the abilities and knowledge needed by the professional accountants. The areas of content can be looked at, firstly, from a general point of view, following specific competencies especially in the function of user of information and communication

technology, but, addressing in equal measure to the other functions also. Table 1 presents the main knowledge and competencies directed at the accountants from the point of view of information and communication technology usage in the field where they perform.

In the process of identification of knowledge and general abilities, the main fields of competencies have been grouped into two axes: general and specific knowledge in the IT field and competencies in IT use and control.

4.2. The dimension of the functions related to the accounting profession in the IT&C field

IEG 11 (IFAC, 2003a) recommends packages of competencies diversified in relation to the IT&C functions specific to the accounting profession (Table 2).

Table 2. The dimension of competencies in IT&C functions specific to the accounting profession

| | | | |
|------------------------|--|--|--------------------------|
| IT manager Role | <ul style="list-style-type: none"> • The business entity IT&C strategy administration • The management of IT&C organizational structures; • Efficient and effective management of IT&C operational environment; • Achieving financial control over IT&C resources; • Conducting the IT&C controls; • Managing the Information Systems acquisition, development, and implementation process; • Efficient change management; • Managing efficiently IT&C critical issues | <ul style="list-style-type: none"> • Analysis and evaluation of information from organizational environment • Use project management methods • Use techniques for initiating an IT&C project and to evaluate the existing information system • Use methods for determining user requirements and system design • Understand the process of system maintenance and change management | IT designer Role |
| IT user Role | <ul style="list-style-type: none"> • Using business specific programs packages • Understanding Business Process Management Systems • Applying control measures to protect organization assets | <ul style="list-style-type: none"> • Define an information system evaluation plan; • System assessment by applying CAATs techniques; • Communicate the results of assessment and monitoring the implementation of recommendations. | IT evaluator Role |

(Adapted from IFAC, 2003b)

These competencies packages will be completed with inter-personal communication abilities needed for an efficient communication with all the involved actors from the organizational environment: organization's board, employees, suppliers and customers.

4.3. The dimension of IT technologies needed for IT&C competencies deployment

In the present paper we refer to the research of Wessels (2005) regarding the definition of a reference list comprising the IT technologies considered essential for the accounting profession, some of them being found through the standards elaborated by IFAC for the IT&C field. In the present study, the technologies used for obtaining and practicing the IT&C competencies for each role have been grouped according to the tasks performed by the professional accountant.

Table 3. The main identified technologies that can answer to the IT&C competencies required for the accounting profession

| | | | |
|----------------------------|---|---|--|
| Business activities | <ul style="list-style-type: none"> • Small Business Accounting Software • Tax Return Preparation Software • Time Management & Billing Systems • Firewall Software/Hardware • External Network Configurations • User Authentication Systems • Internal Network Configurations • Intrusion Detection & Monitoring • Wireless Communications • Digital Communications • Encryption Software • EDI-Traditional • EDI-Web Based | <ul style="list-style-type: none"> • Cooperative Client/Server Environment • Test Data • Database Search & Retrieval • Flowcharting/Data Modeling • Enterprise Resource Planning • Simulation Software • Workflow Technology • Database Design & Installation • Application Service Providers • Computer-Aided Systems Engineering (CASE) Tools | IT evaluation, design and management activities |
| Office activities | <ul style="list-style-type: none"> • Word Processing • Electronic Spreadsheets • E-Mail • Internet Search & Retrieval • Image Processing • Electronic Presentations • Groupware | <ul style="list-style-type: none"> • Electronic Working Papers • Generalized Audit Software • Embedded Audit Modules/Real-time Audit Modules • Expert Systems | Control and audit activities |

(Adapted from Wessels, 2005)

Thus the technologies answer to the business activities, office activities, control or audit (both financial and IT) activities, and to those specific to involvement in the evaluation, design and IT management teams. Synthetizing the most important stressed technologies as being critical in relation to the competencies specific to IT functions of the accounting profession can be tracked in Table 3.

Each of the three cases in the above tables surprise IT&C skills from different perspectives obtained by combining the dimensions stated in the aforementioned framework analysis. Educational needs in this area for the accounting profession must be identified through an integrated approach of all three dimensions, considering, equally, the level of experience required to acquire these competencies. Therefore, the formulation of relevant educational offerings must start from the formulation of the specific competencies, the technologies needed to put them in practice and the required level of experience.

5. A QUESTIONNAIRE-BASED ANALYSIS ON THE PERCEPTION OF PROFESSIONAL ACCOUNTANTS ON IT&C USE IN THE FINANCIAL-ACCOUNTING FIELD

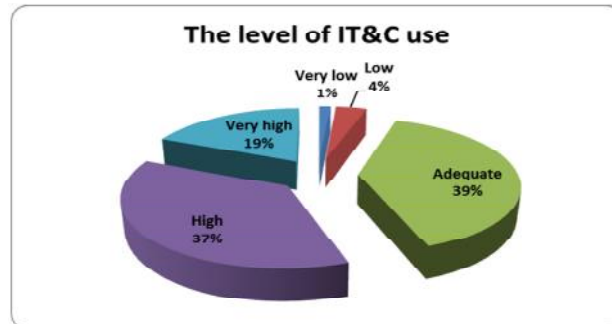
In order to identify an opinion on the use of ICT component at professional level in financial accounting field, an analysis based on a questionnaire was conducted with the purpose to lead to the provision of an image on the professional accountants' perception on the correlations imposed by the abovementioned analysis framework.

The objective of the questionnaire is to identify correlations that can be made between information technologies useful in the financial-accounting domain and the associated competencies. Thus, the questionnaire was structured based on the conceptual framework of analysis that tries to capture specific IT&C competencies necessary to the accounting profession at the crossroads of the accounting roles in relation to IT&C component, with the technologies used in the field and with the level of experience needed to use them.

A number of 1510 people accepted the invitation to respond to the questionnaire, having an average age of 38 years and an average professional experience in accounting field of about 12 years, most presenting undergraduate and post-graduate education. The questionnaire was divided into several parts that can identify correlations regarding the proposed analysis model: Implementation of ICT in financial accounting activities; Types of technologies; Knowledge, skills and competencies and Accounting roles. Several important aspects were followed. First, the perception of the level the IT&C component use in accounting activity was analyzed as a whole and in detail. The majority of respondents stated the level of IT&C use in the activity specific to accounting and auditing profession as being adequate or high. It was noted, overall, that the percentage of responses suggesting a degree of low or very low usage is very modest (only 5% of all responses

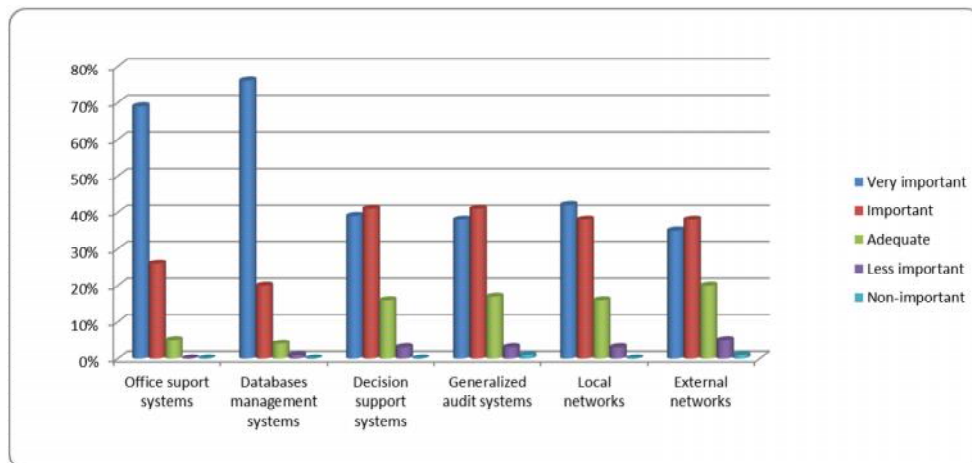
combined), which demonstrates the importance of the perceived usefulness of IT&C in accounting and audit activities. Thus, we can conclude that the respondents are aware that a separation between information and communication technology and the specific accounting profession cannot be achieved.

Figure 3. The overall representation of responses for the level of IT&C use



The level of importance perceived by the respondents on type of software could be followed by a comparative analysis of those technologies considered appropriate in the financial, accounting and auditing activity.

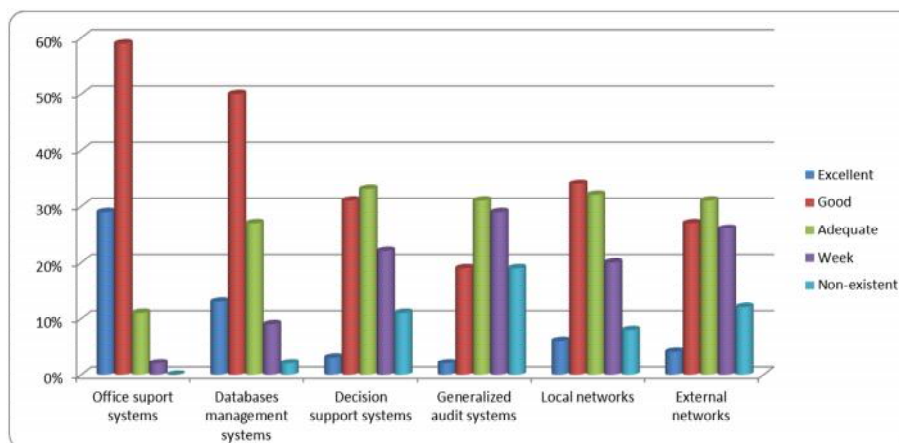
Figure 4. The importance of software applications from the perspective of their usefulness in the work of accountants / auditors



From this comparative analysis of the covered categories, best represented remain office support systems, followed by the databases management systems, then by decision support systems. External networks and local networks are less representative in order of importance, but nevertheless, from the total number of respondents, most stated that it is important to know these technologies for the effective exercise of the accounting profession.

Regarding the level of knowledge and skills in the use of the main categories of technologies, the largest share (about 60%) of respondents stated a good degree of knowledge for the Office applications. Furthermore, this type of ICT applications recorded the highest percentage for Excellent response, which suggests that this type of applications are most common in the work of accountants and auditors. Regarding the category of databases, the most frequent level of knowledge is Good, only 13% of respondents saying that excels in this area.

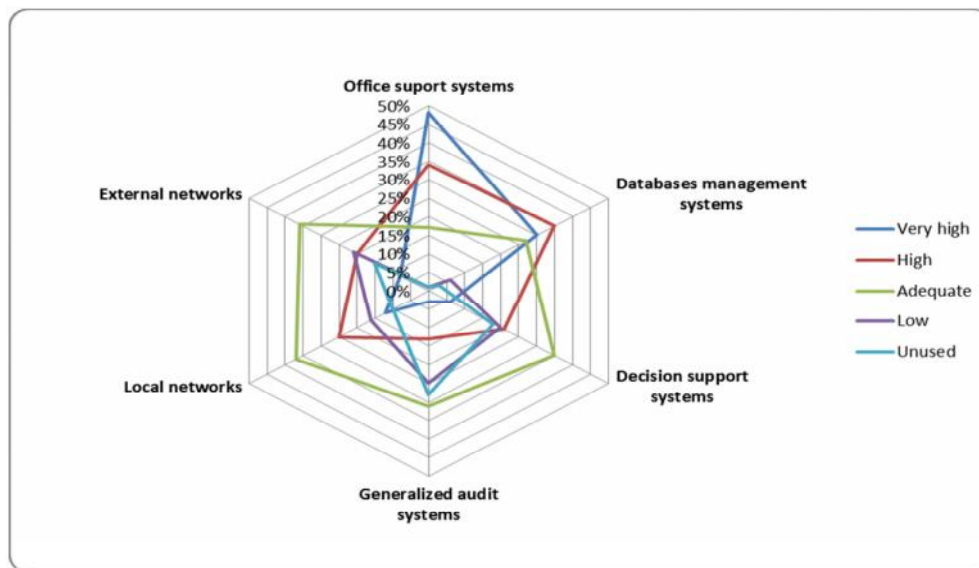
Figure 5. The level of knowledge and competencies in using software applications



It should be noted, also, the very small percentages of respondents who consider they do not have any knowledge in Office and databases fields. Decision support systems and audit systems own a relatively close structure in terms of responses, the most frequent occurrence having the response with an appropriate level of knowledge and skills. The use of local and external networks has a relatively uniform distribution of responses across the five levels of knowledge, most respondents saying that their level of knowledge and skills in use can be classified as good or appropriate and very few considering that they have an excellent level of knowledge.

Another line of analysis targeted the degree of IT&C use, taking into account five categories of common software applications. Summarizing the responses situation, we note high percentage (over 50% cumulative) of respondents who use office support systems and databases frequently or very frequently (most declaring a high and very high utilization level for these two types) and an adequate usage level for users who use other types of software applications taken into account.

Figure 6. The level of IT&C use by software categories



A more complex view of reality can be obtained by highlighting the correlations established between responses that analyze distinct phenomena for the same variables. It can be seen, thus, how differ the responses regarding the importance in relation to the need for knowledge, usefulness and to the current level of use in practice for each of the software applications analyzed in this survey.

*Table 4. The overall situation of responses analyzing different phenomena
for distinct software categories*

| | Excellent | Good | Adequate | Weak | Absent |
|--|-----------|------|----------|------|--------|
| <i>The level of importance from the perspective of utility</i> | 69% | 26% | 5% | 0% | 0% |
| <i>The actual level of knowledge and competencies</i> | 29% | 59% | 11% | 2% | 0% |
| <i>The actual level of use</i> | 48% | 34% | 17% | 1% | 1% |

It can be seen how responses corresponds in most situations for the three analyzed events. A significant difference can be observed, however, in the light of responses to the question which analyzes the level of importance assigned to this type of application and the current level of knowledge. In this sense, we can make the observation that, although respondents felt that the level of importance and implicitly, the level of use is very high in terms of usefulness of these software categories in their work, however, only a third of respondents consider the current level of their knowledge as being excellent, most qualifying the level of skills and knowledge in this field as being good.

Moreover, the differences in responses can be observed by analyzing the correlations between the pairs of events analyzed. Thus we have seen a strong correlation between the answers to the question of importance and the one that questions the current level of use in practical applications such as office support (Office), while the correlation between the knowledge and the other two phenomena analyzed (importance and level of use) is much lower, as can be seen below:

Table 5. The linear correlation between importance, knowledge and level of use for the chosen software categories

| Analyzed phenomena | Linear correlation coefficient |
|--|--------------------------------|
| <i>Correlation between importance and knowledge</i> | 0,54 |
| <i>Correlation between importance and level of use</i> | 0,93 |
| <i>Correlation between knowledge and level of use</i> | 0,76 |

Positive values of the correlation coefficient indicates a direct link between the phenomena under analysis, more pronounced among importance perceived by the respondents and the level of use and less pronounced in the other two cases. Nevertheless, analysis of the correlation between the responses reflects only the degree of connection between the responses of the same kind for the three events analyzed. A weighting of responses to the three questions for this type of software reveals a much more suggestive image of the actual situation on the respondents' assessments. Thus, for each choice has been assigned a score (5 excellent, 1 for non-existent), the answers to these questions being weighted with the percentages represent the share in total responses, thus obtaining a weighted average showing which is the average level of respondents assessments in terms of three analyzed phenomena. It could be seen, following this analysis, that the average response is placed between good and excellent option for all the analyzed factors. However, one can observe a lower average value for the current level of knowledge and skills from the other two values, suggesting a possible improvement of this situation by increasing the competencies and knowledge in the field of office applications.

Table 6. Weighted averages analysis for software categories by the means of the three indicators

| | 5 | 4 | 3 | 2 | 1 | Weighted average |
|---|-----|-----|-----|----|----|------------------|
| <i>The level of importance from the perspective of usefulness</i> | 69% | 26% | 5% | 0% | 0% | 4,64 |
| <i>The current level of knowledge and skills</i> | 29% | 59% | 11% | 2% | 0% | 4,18 |
| <i>The current level of use</i> | 48% | 34% | 17% | 1% | 1% | 4,30 |

Regarding the technologies used in practice, the level of importance perceived in terms of usefulness in the work of accountants and auditors was considered high for technologies used in office activities and business activities and less to those used in the control and audit activities, respectively in the evaluation, design and management of IT&C systems. The answers, however, must be correlated with those concerning the skills and knowledge for each category of technology analyzed and with the evaluation of the degree of using IT&C in practice. Thus, regarding the technologies for the office activities we found a strong correlation (0.85) between the responses on the importance and the use of technologies in office work, while the correlation between the level of importance and the level of knowledge is much lower (0.66). The fact that the three correlation coefficients have positive values demonstrates a direct relationship between the three phenomena analyzed here.

About the technology that can be used in business activities, we can conclude that the respondents are aware of the importance of these technologies in their work, although the level of knowledge and use are much lower.

Analyzing correlations established between the three events, although the three factors have positive values, denoting a linear dependence, a strong correlation can be observed between the level of knowledge and the level of use.

Table 6. The linear correlation between the importance, level of use and knowledge for the technology dimension

| Analyzed phenomena | Linear correlation coefficient |
|--|---------------------------------------|
| <i>Correlation between importance and knowledge</i> | 0,318 |
| <i>Correlation between importance and level of use</i> | 0,105 |
| <i>Correlation between knowledge and level of use</i> | 0,773 |

As regards the technology for audit and control activities, as well as those on the design, evaluation and management of ICT, the answers reveal a linear correlation between the positive and the use of knowledge, but a negative dependence among the other phenomena. This can be interpreted as follows: although the practical experience of the respondents for this category of technology is low, the degree of importance perceived by respondents is high.

From the perspective of the role of ICT in accounting or auditing work, the analysis was done in terms of the importance of skills related to each of the user, designer, evaluator or IT manager roles, and in terms of current knowledge and level of use. Best represented in this respect remains IT user role, the correlation between perceived importance and level of use being high for the categories of technologies for office and business activities. It was found that the level of knowledge perceived as necessary in exercising the roles of evaluator, designer or manager of IT&C systems should be a high one, involving skills in all areas of

technologies. Nevertheless, from the analysis of the responses, has been observed that, although the level of perceived importance of these roles is considered by the most of respondents as being adequate or high, the utilization degree of these specific technologies is low, demonstrating a possible direction of action in the education concerning these roles.

CONCLUSIONS

The demand of education regarding the development of the IT&C component that targets accounting professionals is highlighted and widely accepted by IFAC members worldwide. Normally, IT knowledge and competencies development must be integrated with education from the areas of accounting, auditing and taxation. In the short term, it is likely that this goal cannot be realized due to the time needed to restructure courses, training of qualified instructors, and so on. In the long term, implementation of a training program that takes into account the need of symbiosis between information technologies and accounting in the case of professional accountants training requires an integrated approach for improving the quality of training stages through the IT&C component.

The reality of the modern economic environment indicates that, in Romania, the training program of professional accountants destined for IT competencies development that is offered by the CECCAR organism does not meet the worldwide acknowledged standards (IES2 and IEG11 – IFAC, 2003).

The accounting profession training emphasizes knowledge gathering (especially from the financial, accounting and tax domains) and only slightly does it address acquiring and growing the necessary competencies for the IT&C field. Starting from this goal, through the present paper, an analysis of the actual status regarding professional accountants training through the IT&C component has been conducted, and a conceptual analysis framework for IT&C competencies in this field has been proposed.

The contribution of the research is focused on two dimensions: one theoretical and one practical. At a theoretical level we have conducted an analysis of the state of knowledge in the field of the development of IT&C training and competencies for professional accountants. Based on the literature review there are specified and we have justified the importance of introducing information and communication technology in subject areas specific to accounting education. Many authors (Harrison *et al.*, 2004; Wessels, 2005; Cardoso, 2011; Ku Bahador *et al.*, 2012, Havelka & Merhout, 2009) deal with this issue, through either empirical studies conducted on different populations, or only through studies at a conceptual level. Other authors (Wessels, 2005; Greenstein & McKee, 2004; Theuri & Gunn, 1998) address the issue regarding IT&C technologies applicable for the accounting profession. Our findings on the state of knowledge have determined in us the development of pragmatic side.

Thus, in practice, research has focused on designing a framework for analyzing IT&C competencies required for the professional accountants from Romania to implement training/development programs in line with international standards requirements. This framework captures IT competencies located at the intersection of three priority axes (Functions, Levels of experience and IT&C Technologies) that will guide the process of definition of thematic areas and specific competence domains. In our opinion, alongside the specific issues of the financial accounting system, an adequate attention should be paid to the use of general IT tools in achieving and interpretation of financial situations or situations specific to the other accounting roles within enterprises. A relevant analysis of the IT tools that professional accountants need to know must present, along with the usefulness of each technology required, the level of experience needed for each of the functions. The three perspectives of analysis always converge to a certain central point in which the IT competencies regarding the accounting profession are explained by role descriptors, through level of training that is adequate for that role and through the education offer (defined by curricula areas with specific subjects) that is necessary to the understanding and the development of the competence in question.

The analysis based on questionnaire has emphasized the perception of the accounting professionals in Romania on the need for IT&C training and competencies development through the proposed IT technologies in the analysis framework. It revealed a strong relationship between the dimension of ICT competencies related to the accounting profession and the perceived importance on the utility of various technologies which were the subject of analysis. As for the roles played by the professional accountant, we could outline a possible direction of action on accounting education in IT&C field associated with the roles of evaluator, designer or manager of accounting information systems, based on their importance in relation to the degree of knowledge.

Overall, the interpretation of the questionnaire responses led to the enunciation of a clear conclusion: the educational needs analysis should take into account the existing and the necessary level of knowledge of certain technologies related to the duties expressed through the roles they perform in a professional way.

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