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Expert Systems Within Taxation

Competencies for Employees

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Abstract — Expert Systems (ES) is increasing its importance, impacting not only personal life but also professional life and its workplace. With ES's growing impact on tax areas, tasks of tax practitioners will change and progress. In addition to financial, legal and tax knowledge, these workers will need to develop and apply technical and analytical knowledge for the use of ES. This research proposal proposes to study the relationship between the presence of ES in taxation and the skills that the labour market imposes. The aim of this study is not only to identify the skills required for technological work within taxation, but also to build and validate a model that contributes to an improvement in the ability to predict workers' ability to adapt to new work demands.

Keywords - competencies; expert systems; taxation.

I. INTRODUCTION

Expert Systems (ES) have already confirmed their value in a range of various domains. In this sense, to this date, few financially oriented systems have progressed well beyond the experimental stage. In this group of systems, there are also ES within taxation field.

It is generally recognised that the roots of expert systems are in artificial intelligence, which is as well gaining prominence in the context of tax work. In this regard, AI allows the most repetitive tasks to be accomplished by machines, meaning that workers and analysts will be able to focus on the most relevant and strategic tax issues - those that really need human perspective and can effectively result in positive results for companies - such as defining the Supply Chain or tax efficiency mechanisms.

Costs control, corporate merges & acquisitions (M&A) all contribute to greater pressure over tax departments within the companies. At once, global tax guidelines and trade classification is becoming more and more complex and difficult to fulfil. As well, cross border transparency is increasing, and digital reporting is increasing, so tax departments are facing new challenges regarding data analysis.

In fact, within fiscal context, intelligent systems not only will be able to learn how to perform the most mechanical and repetitive jobs (such as, filling out reports and fiscal forms), but also, having enough data to that, do the classification regarding the relevance of the information used to take conclusions.

Thus, ES will present only the more important and relevant data for the decision-making process and may even predict future results based on the analysed historic. Proof of this is

that some countries in the world already use AI and ES to guarantee compliance within taxation and to cross tax data.

Summarizing, there is already evidence that ES not only increases the effectiveness of the work in taxation, allowing to solve and execute routine tasks of less relevance in the decision-making process, but it can also develop and present predictions and key information for future decisions.

The exposure of tax workers to ES is, considering information above mentioned, a point of investigation relevant to the state of art, presenting not only academic interest and relevance, but also for business scope and applications.

Also, in the context of tax consultancy, it is expected that the growing presence of digitalization, AI and ES in the tax function will lead not only to greater automation of routine activities, but also to real-time analysis and (unprecedented) optimization of tax results. of companies. This clearly advantageous advancement in the business context arises because of a uniform and consistent availability of data, and the application of timely and correct analytical methods to them.

ES is within the digital transformation we are all assisting to, so it must be considered that “the societal impact of the digital revolution has been significant as it has affected most aspects of our lives and work”[1]

Regarding taxation, “taxation systems also seem likely to be popular. Many firms spend a high proportion of their time dealing with the interpretation of tax rules as they apply to a particular client’s circumstances.”[2] Until 1987, already a “number of systems have been developed, each in a limited tax domain”[2].

As all workers exposed ES, tax workers also have perceptions and reactions to those systems and its applications in their workplaces, tasks and jobs. This “calls for a new human-machine symbiosis, which presents a shifting division of work between machines and humans.” [4].

Thus, one of the main spheres needed for this symbiosis which are impacted by ES is the competencies of these workers, since they must deal with and work with new tools of ES. So, there is the intention to perceive the relevance and importance of ES for the competencies of tax worker who deal with it.

In order to understand the impact of the ES within the competencies of these workers, it is important to realize and

perceive the effective presence of ES (and AI) in taxation world.

Extrapolating AI figure on ES, Makridakis (2017) refers that “As we head towards uncharted waters and uncertain choices the obvious challenge is what can be done to maximize the chances of exploiting the benefits while avoiding the negative consequences of AI technologies? There are two positive aspects in dealing with this challenge. First, the dangers are well understood and secondly, there is plenty of time to debate the issues and take wise actions to deal with them effectively.”[1]

The intend of the study starting with this paper is to contribute to the debate of the ES, as well as have a positive contribute to take, like the Makridakis call, “wise actions” to deal with the presence of AI and ES.

Considering that this research intends to contribute to an understanding of how ES impact Tax Workers’ competencies, it comprises the following sections:

- i. Literature Review of main Concepts and Framework;
- ii. Research Questions and Objectives;
- iii. Study proposal; and
- iv. Expected results.

In this sense, first part of this paper presents a brief review of the existing literature with framework of competencies, AI, ES and ES in the context of taxation.

Additionally, this research project contributes to increase knowledge in the field of human factors associated with Taxation and ES cumulatively, but also contributes with knowledge that allows better planning of the recruitment, selection and training of the professionals involved, as well as the strategies and processes for duly integrating ES in the context of corporate tax requirements, in order to increase the efficiency of the work developed.

II. LITERATURE REVIEW

A. Competencies

Dubois (1998) defined competencies (plural for competency) as ‘those characteristics - knowledge, skills, mindsets, thought patterns, and the like - that when used whether singularly or in various combinations, result in successful performance’[5].

“There is no agreement about the best combination of competencies for enhancing labour market success”, this lack of consensus could come from the ‘difficulty in measuring competencies and the variety of approaches available for doing so’. By literature review, it can be observed that some refer competencies transversal and transferable across not only jobs, but also personal situations, while others clear-cut specific technical skills by occupation, task or job [6].

According to the OECD, in its paper The Definition and Selection of Key Competencies,

‘a competency is more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilising psychosocial resources (including skills and

attitudes) in a particular context. For example, the ability to communicate effectively is a competency that may draw on an individual’s knowledge of language, practical IT skills and attitudes towards those with whom he or she is communicating.’[7]

For the purposes of the research here presented it is also important to analyse and point competencies gathered and proposed by Teijeiro, Rungo and Freire in their study. Table 1 illustrates those 19 competencies classified by types, as defined by the authors. [6]

TABLE I. COMPETENCIES BY TEJEIRO, RUGO AND FREIRE (2013)

Instrumental	Basic knowledge of the profession
	Ability to communicate
	Problem solving
	Ability to organize and plan
	Decision making
	Information management abilities
	Ability to analyse and synthesize
Interpersonal	Ability to work as a team
	Interpersonal abilities
Systemic	Ethical commitment
	Responsibility at work
	Ability to learn
	Motivation for work
	Concern about quality and improvement
	Ability to apply knowledge to practical situations
	Motivation to reach goals
	Ability to adapt to new situations
	Ability to work independently
	Ability to generate new ideas

Teijeiro, Rungo and Freire (2013)

This distinction in three main domains was based on the study entitled “Tuning Education Structures in Europe” (2007), carried out by over 100 universities, coordinated by the University of Deusto (Spain) and the University of Groninger (The Netherlands) and supported by the European Commission.

It is important for the purposes of the research here presented to consider that these authors defined these three domains as:

‘Instrumental competencies are defined as cognitive, methodological, technological and linguistic abilities, which are necessary for understanding, construction, operation and critical use in different professional activities. Interpersonal competencies are related to one’s ability to interact and network with people, as well as the ability to actively participate in specific or multidisciplinary work groups. Systemic competencies are skills relative to systems, and require a combination of understanding, sensitivity and knowledge that allows one to see how the parts of a whole relate and come together.’ [6]

B. AI, ES & ES within Taxation

Difficult to define, it is thought that “roots of AI can probably be traced back to the 1940s, specifically 1942, when the American Science Fiction writer Isaac Asimov published

his short story Runaround (...) a story about a robot developed by the engineers Gregory Powell and Mike Donovan (...). AI is defined as “a system’s ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation.” [8]

Expert systems, designed to replicate certain abstract reasoning and problem-solving capabilities of humans, are most suitable to cope with semi-structured problems [9]. Semi-structured problems are those for which a considerable body of knowledge exists as to the ways in which a given problem ought to be tackled [10]

Back into mid-1960’s, ES appeared by the hands of the AI community, as a branch of applied AI. In this light, it is important to notice that “The basic idea behind ES is simply that expertise, which is the vast body of task-specific knowledge, is transferred from a human to a computer. This knowledge is then stored in the computer and users call upon the computer for specific advice as needed. The computer can make inferences and arrive at a specific conclusion. Then like a human consultant, it gives advice and explains, if necessary, the logic behind the advice”[11].

Hence, ES utilization is proliferating with many sectors of social and technological life, “where their application are proving to be critical in the process of decision support and problem solving”[11].

Shu-Hsien Liao (2005) presents different types of ES, namely: rule-based systems, knowledge-based systems, Neural networks, Fuzzy expert systems, Object-oriented methodology, Case-based reasoning, Modelling, System architecture, Intelligent agents, Ontology and Database methodology and their applications, reviewed from articles “from different categories including agriculture, agronomy, automation, biochemistry, biology, chemistry, computer science, biology, ecology, education, energy, engineering, entomology, environmental sciences, genetics, geochemistry, geology, geosciences, health care sciences, haematology, hydrology, materials, mathematics, mechanics, medical, military, operation research/management sciences, ontology, plant science, remote sensing, robotics, and water resources.”

This author also refers “different social science methodologies, such as psychology, cognitive science, and human behaviour could implement ES as another kind of methodology. Integration of qualitative, quantitative and scientific methods and integration of ES methodologies studies may broaden our horizon on this subject.”[11]

In 1987, Connell identify five expert systems developed for use in taxation, namely TAXMAN, CORPTAX, TAXADVISOR, ACCI and TA, which reveals an early importance of ES for corporate tax. [2]

As already seen, trough last decades, these ES “have received increased attention from accounting academics and professionals”. Already in 1992, Karlinsky and O-Leary intend “to make tax experts, tax researchers and knowledge engineers aware of the benefits and limitations of working in and with taxation based ES.”[12]

Regarding Expert System Decision Support, Workman indicated “that when people have a high degree of trust, they tend to follow the recommendations made by the technology, and when they have a low degree of trust they may or may not to follow the directions.” [13]

As well, talking about the use of EDSS, Workman refers “where communications technology facilitates interchange among people, the transaction with expert systems is between person and computer; and where conventional applications respond with information from user requests, expert systems not only provide information, but also suggest or make recommendations.”[13]

Moreover, it can be stated that there are, through ES and AI literature, presence of ES within tax systems and approaches. [12][14][2][15]

III. RESEARCH QUESTIONS

Research here presented aims to understand the impact of ES in taxation, and then in tax workers’ and their competencies. In this sense, this research intends to examine following research questions (see Fig. 1):

- v. How are the skills of tax workers impacted by the presence of ES in the work context?
- vi. Does the presence of ES in the workplace contribute as a moderator or mediator in the relationship between tax workers competencies and other variables?
- vii. What skills are appropriate to Tax Workers better deal with an ES in its workplace?

In this sense, through this research it will be possible to understand the impact of the use of ES in taxation work in workers’ competencies, analysing their reactions to the presence of ES as well as the competencies profile that will be better to fit with the utilisation of ES for taxes.

When considering tax workers, it is important to clarify that it is being considered following employees:

- Workers in tax and fiscal departments within companies from all sectors and industries;
- Consultants (analysts and senior - tenure is indifferent) from Tax Consultant companies; and
- Tax Consultant Partners.

Since we can already perceive that there are a growing and relevant presence of ES in the work with taxes and taxation, it will be newsworthy to see how employees are being impacted by that.

IV. METHODOLOGY

Methodology used in this study will be applied within three main phases: (i) literature review, (ii) qualitative analysis and (iii) quantitative analysis.

First part will gather conclusions through the revision of theoretical framework, from peer reviewed research. It will allow to build the initial point to a research with the construction of a 1st model of relationship between the

presence of ES in taxation workplace and tax workers' competencies.

Second part of this study is run by development of Focus Group and Interviews, where it will be gathered an information regarding the research questions. This will allow to build and explore, gathering information collected from the previous phase of the study, a new model of relations.

Interviews will be conducted with identified decision makers (managers, partners or tax departments responsible) and available for collaboration in the study. These interviewed will have full knowledge regarding general and specific objectives of the research project, as well as the perception that, when finalizing and concluding the investigation process, they will have access to the conclusions taken. These interviews aim to (i) collect valuable contextual information to explain and relive some specific phenomena of the presence of ES in taxation work; (ii) identification of potential workers to participate in the research project (namely Focus Group); (iii) understand the perception of employers regarding to the presence of ES in the context of taxation and its impact on workers' skills; (iv) find possible new exploration points for the research project.

Focus Group of 6 to 10 people (or other number more adequate to be defined) gathered for the discussion on the research questions, conducted with the employees identified and available for collaboration in the study. This instrument is applied throughout the research project at least 3 times in 3 groups. All the individuals will be aware of the general and specific objectives of the research project. These focus group aim to (i) collect valuable contextual information to explain and relive some specific phenomena of the presence of ES in taxation work; (iii) understand the perception of tax workers regarding to the presence of ES in the context of taxation and its impact on workers' skills; (iv) find possible new exploration points for the research project and questions.

Finally, the third part of this research is an application of a questionnaire to a sample of tax workers. With this application, it is intended to have enough data to validate (or not) the model proposed in the Exploratory Study phase. From this last part, it will be available information to build and define a relationship model between ES and Tax Workers' competencies.

V. EXPECTED RESULTS

It can be perceived there are a clear impact of ES in the scope of taxation. Thus, developed work within this research will intend to show the possible relations between the presence of ES and other variables.

It can be expected that presence of ES positively impacts instrumental competencies, enhancing its development. Notwithstanding, systemic competencies maybe could be negatively impacted by the presence of ES in the tax workplaces. Systemic, instrumental and interpersonal competencies, proposed by Teijeiro, Rungo and Freire (2013), have different reactions to the presence of ES (see Figure 1).

It is also worth of note that some competencies presented by these authors can play a role of moderator between the introduction of ES and a better performance of the companies.

This moderation behaviour, from a surface approach to the literature, must be positive or negative, according to the type of competencies analysed (as it can be observable in Figure 1).

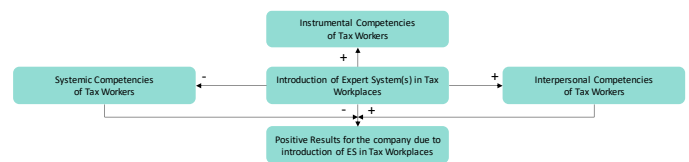


Figure 1. Proposed Relations between competencies and ES

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