INCREMENTAL REDESIGN OF THE ACCOUNTING PROFESSION IN THE CONTEXT OF DIGITALISATION AND INDUSTRY 4.0

Andreea CORDOS (LABADITIS)
andreea.cordos@econ.ubbcluj.ro
Coordonator științific: **Adriana TIRON TUDOR,** ORCID ID: 0000-0001-5530-5635
Babes Bolyai University, Cluj-Napoca, România

*Abstract. The purpose of the research is to make a deep dive into the perception over technology usage amongst the accounting professionals, while trying to assess its current level of utilization and understanding in the field. The paper tries to snapshot the status quo on the international market of accounting professionals in terms of current level of technological use, understanding and behavioural intention to use new technology, along with contributing factors. **Methodology**: With this purpose a questionnaire is prepared based on the adapted TAM methodology to understand how the accounting professionals are positioned against the developing technologies. The questionnaire will focus on the accounting function of companies or accounting companies, all in different stages of technological development.*
*The methodological approach to be used within the proposed paper is exploratory, with mixed methods of qualitative research such as questionnaires and in-depth literature review. **Originality/value**: Originality of the paper comes from performing an extended analysis in a transition period for most companies and trying to go beyond perceptive analysis towards the root causes implied.*
Keywords*: digitalisation, accountant, TAM, industry 4.0*
JEL: M40, M41

Introduction.

Today, the current world context is forcing the accounting profession into a steady transformation process. The current technological advancements are making it impossible to maintain on the long run the idea of the traditional accountant.

The information technologies comprising of blockchain, big data, artificial intelligence are pressuring the imminence of the "digital" in economy and industries (Moll, 2019), hence requiring of accountants for an abundance of tasks that can lead toward a more value adding contribution within the companies.

At the peak of technological development stands the great advantage of undertaking and manipulating massive amounts of data, generating an immense opportunity for companies to make use of it for making the best decisions. This workstream of data gathering, manipulation, analysis, up to formulating decisions is manageable by the hands of professionals in the field of accounting. In the words of IMA President Jeffrey Thomson who observed that "These changes [AI, machine learning, robotic process automation, etc.] are redefining and expanding the role of accountants and making our cultivation of skills such as data analytics, data visualisation, storytelling and strategic management more important than ever before" (Moll, 2018).

Nowadays an accountant with the correct technical and social skills can develop into a key player within a company. With the required skill set, an accountant is now in front of an opportunity, the opportunity of undertaking additional responsibilities and participating in the strategic and decision-making process of the company.

The purpose of the research is to make a deep dive into the perception over technology usage amongst the accounting professionals, while trying to assess its current level of utilization and understanding in the field. The paper tries to snapshot the status quo on the international market of accounting professionals in terms of current level of technological use, understanding and behavioral intention to use along with contributing factors, which is a gap observed in the current literature. With this purpose a questionnaire is prepared based on the adapted TAM methodology to understand how the accounting professionals are positioned against the developing technologies. Originality of the paper comes from performing an extended analysis in a transition period for most companies and trying to go beyond perceptive analysis towards the root causes implied. The link of technology understanding with the perceived usefulness is on the map of the project alongside typology of assimilation strategy linking to confidence in capacity of assimilation an in turn to a perceived ease of use. The transition period in which many companies are, gives a good opportunity to try and understand the paths of technology assimilation and formulate advices for an optimum method to be used in the future.

Literature review

The change of the technology is developing into a spectrum of digital workforce tools which are set at the disposal of the companies in order to automate their business processes. On one side of the workforce spectrum, you can find the basic automation, utilising technology to manipulate existing software to automate business processes (Accenture, 2016). On the other side of the spectrum is artificial intelligence, which is a tool that will perform tasks by making use of existing data and then refining future performance (L. A. Cooper, 2018).

For the purpose of this paper only specific technologies have been selected, based on the relevance of process automation within the accounting functions of a company. Selection was made on the ability to directly connect a technology with the automation of a specific process, therefore technologies such as blockchain or IoT will not be discussed in this paper. A short review of the existing technologies is examined via literature review and synthetized below:

Big Data and Data Analytics	Cloud	Machine Learning	RPA
Definition: Big Data represents large volumes of data, while it`s extraction and manipulation are defined as Data Analytics.	Definition: "The on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user." Wikipedia	Definition: Machine learning is a subgroup of artificial intelligence, representing a method that is able to learn behaviours and has the ability to replicate them. (Cho, 7).	Definition: IEEE defines RPA: "A preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions" (IEEE Corporate Advisory Group 2017).

The big players on the market are already making use of the potentials of AI in their daily operations, understanding that a hybrid working model is the future business model. Teams comprising of machines and humans potentiate each other's capacities. (Kruskopf et all, 2020). Manyika states that though the impact of such changes is only just arising , it estimates that 50% of current operations can be directly automatized through current technologies, adding an estimated 15% more to be covered by forthcoming technologies (Manyika, 2017).

The challenge forthcoming the field of accounting is obvious, and adaption is imperious. How professionals should respond to the change will establish their fate. (Arraou, 2016). Accounting

professionals that are currently in the working age are beginning to understand the fluctuant role of their profession. Depending on the work environment, the degree in which this is acknowledged differs.

The study aims at reaching towards a number of accounting professionals from a variety of industries, from the area of accounting and management accounting, various positions, from companies of different sizes and degrees of automatization and tries to get the pulse of how the accounting profession has changed, how are the best adapters succeeding, how prepared are the people already working in the field and how much do they understand of the upcoming challenges.

Several studies in the field already established a good impact of automation in the life of accountants. Cooper concludes a study by stating that the use of RPA technology is seen to increase employee satisfaction as routine tasks are automated and the opportunity to climb the promotion ladder is higher. The limitation of the study is that the respondents are from big four companies which provide continuous opportunity of technological development (Cooper, L.A., 2018).

Following a research by Kokina, 2019 it was concluded that RPA implementation gives immense opportunity within a company for accountants to expand their current roles towards process improvement, exception analysis, robotic software development (Kokina, 2019). Also Oesterreich, 2019 concludes in a study that there is certainly a skills gap for the management accountants in regards to Business Analytics. The current study aims at understanding the perception, understanding and attitude of the accountants in relation to these existing knowledge gaps.

As stated as opening words, prior to the 2015 Congress, Arraou said: "In an uncertain world, our future depends not only on our primary resources or our economic capital, but on our ability to understand and anticipate change" (Arraou, 2016). The existing literature already states that accountants need to up their skills in order to keep their competitive advantage, going in the direction of an "accounting plus" skill set, however for freshly graduates the responsibility lies within the forming benches of the academies. The paper tries to formulate advices for a better assimilation of the technology on the market.

The CPA Journal states that "A major wave of educational change is also emerging with the advent of distance education, various forms of unorthodox training, and a large set of new learning needs."(C. Zhang, 2018) however until the reconfiguration of the world of Business in the era of technology is complete, the need is to adapt and assess oneself on a constant basis.

The AASCB Accounting Standards already include statements on the necessity of developing critical and analytical thinking skills in support of professional scepticism, AASCB Accounting Standards.

Theoretical framework

Several theories have been developed over time to assess the capacity of the individuals to incorporate and accept technology advancements. From as early as 1967, when the Theory of Reason Action (TRA) appeared, the interest toward a structured understanding of people`s attitude toward a changed behaviour increased. Later on, a number of different theories emerged, such as Theory of Planned Behaviour (Ajzen, 1985), Decomposed Theory of Planned Behaviour (Taylor, 1995), The Motivational Model (Deci, 1985) and others.

Some theories have similar basis; however all face their own limitations (Alaa, 2017). In this paper the theoretical framework is adapted based on the Theory of Technology Acceptance Model. TAM is one of the most used extensions of TRA, it appeared in 1989 and it`s basis is still largely applied in studying the acceptance and perception of technology.
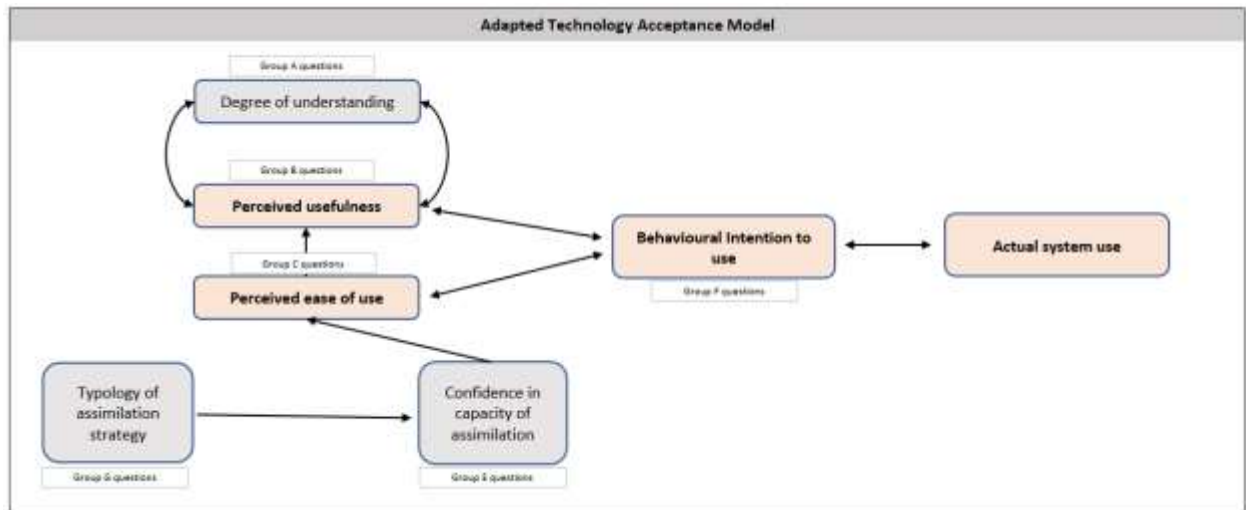
Figure 1. Author's adapted Technology Acceptance Model Theory

The TAM method uses two indicators that lead to the intention of technology usage, and that in general contribute to understanding the psychological impact of accepting new technologies. As Souza (Souza, 2017) stated, the two split as such: perceived usefulness is linked to a person`s ability to recognize that the usage of a certain technology is capable of perfecting it`s behaviour. Additionally, the perceived ease of use is linked to the capacity of understanding that the use of an informational system will happen regardless of his personal effort. In addition, the article factors in that the perceived usefulness is directly linked to the degree of understating a certain technology. The study aims to demonstrate this direct link via the questionnaires. In addition, the ease of use is studied against the assimilation typology which dictates the confidence in the assimilation and in turn, the ease of use. A structured approach towards technological education via on-the-job assimilation is believed to eliminate stress and frustration and contribute to higher degrees of technology acceptance.

Reconciliation Model

The reconciliation model displays the manner in which the extracted data will serve to answer the research questions and provide advice for companies, professionals or students in coping with the upcoming changes.
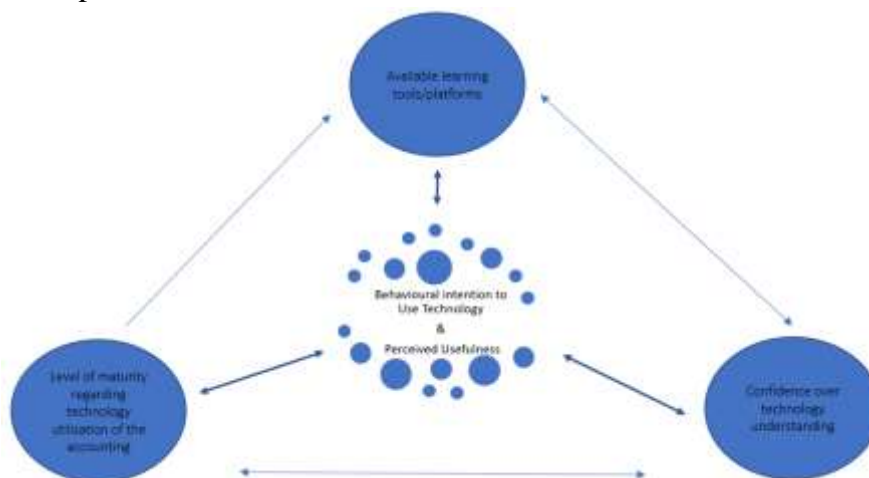
Below is an example of how the mechanism will work:

Figure 2. Reconciliation model

Research questions and metholodogy

In the metamorphosis of the accounting profession triggered by digitalisation and the fourth industrial revolution it is our duty as current professionals and scholars to grasp the meaning of the changes that occur and prepare the work environment and the academia for a quick and efficient adaptation.

The methodological approach to be used within the proposed paper is exploratory, with mixed methods of qualitative and quantitative research such as questionnaires and in-depth literature review. The interest group for the questionnaire is formed of accounting professionals working in accounting companies or accounting functions of companies of different sizes and industries, from international companies. The research is planned for the period between January and March 2022. The questionnaire has already been filled out by more than 100 respondents. In total the aim is to reach more than 400 replies. An even split between different positions held within the company and experience level will bring the best result to the analysis. The channels used for gathering as many replies as possible are academic contacts, job related contacts, LinkedIn, client contacts from current workplace and others.

The qualitative approach uses the questions from the questionnaire for investigate on the relationship the accounting professionals have with new technologies in the field. The need to use strict data to make such correlations led to the usage of quantitative measurement of responses using the 10-point Likert scale, with ranges from 1 to 10 (I strongly disagree - strongly agree). The scale is using several samplings to allow distribution of grades on a scale of action.

The contribution comes from making a direct assessment of the current state of things from different directions such as maturity level of the employing company, learning options and behaviour against technology acceptance. The paper will provide a reconciliation model in which it uses the data obtained to formulate advices for a better transition towards technology on the accounting professional's marketplace.

A summary of the so far analysed responses is presented below. It will not be contained in the final format of the article; however, it can be used to formulate early theories that will be discussed along the development of the research. Due to the reduced number of responses gathered (over 100) no statistical analysis has been performed to the data, it has been read in a straightforward, descriptive manner. The preliminary results are shown below together with explanations on limitations.
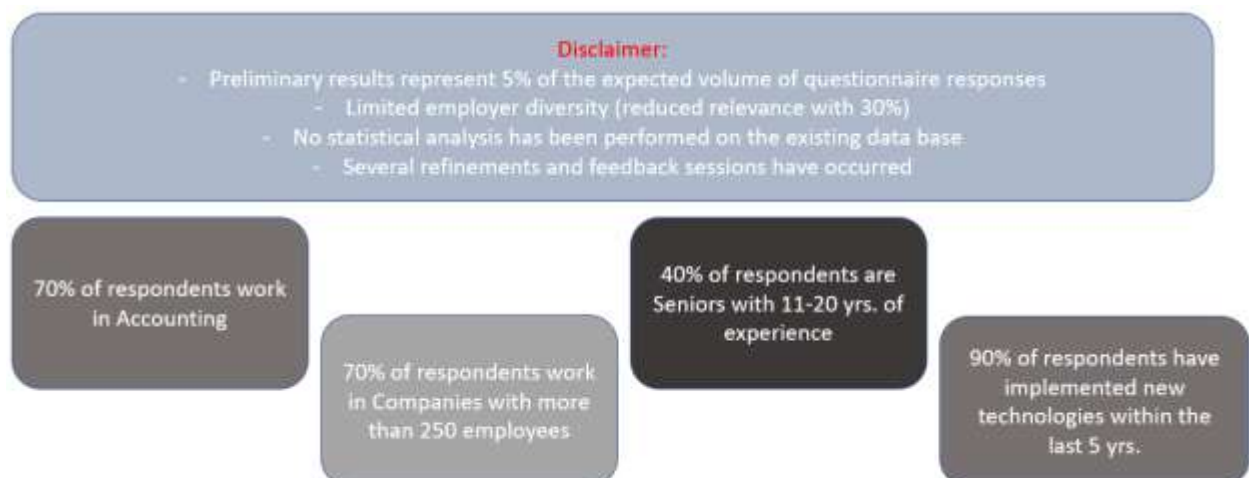

Disclaimer:
- Preliminary results represent 5% of the expected volume of questionnaire responses
- Limited employer diversity (reduced relevance with 30%)
- No statistical analysis has been performed on the existing data base
- Several refinements and feedback sessions have occurred

70% of respondents work in Accounting

70% of respondents work in Companies with more than 250 employees

40% of respondents are Seniors with 11-20 yrs. of experience

90% of respondents have implemented new technologies within the last 5 yrs.

Figure 4. Preliminary results – not included in final version

Due to a high number of respondents from large companies (over 250) employees, the results can generate a false positive in terms of technology implementation. Over 90% of the responses show that the implementation of a "smart" technology has been done within the last 5 years in their workplace. The purpose is to homogenize the employers scale in order to correct the indicator of technological maturity. Nonetheless the below hypothesis has been formed which are not influenced by the size of the companies, as these questions address only the technologically mature employee. It has been reported that the implementation process has not been disruptive, and it generated a positive impact in the daily work. New skills are shown to be mostly learnt on the job. Further on the questionnaire will build up to show a better picture of the status quo on the market today.
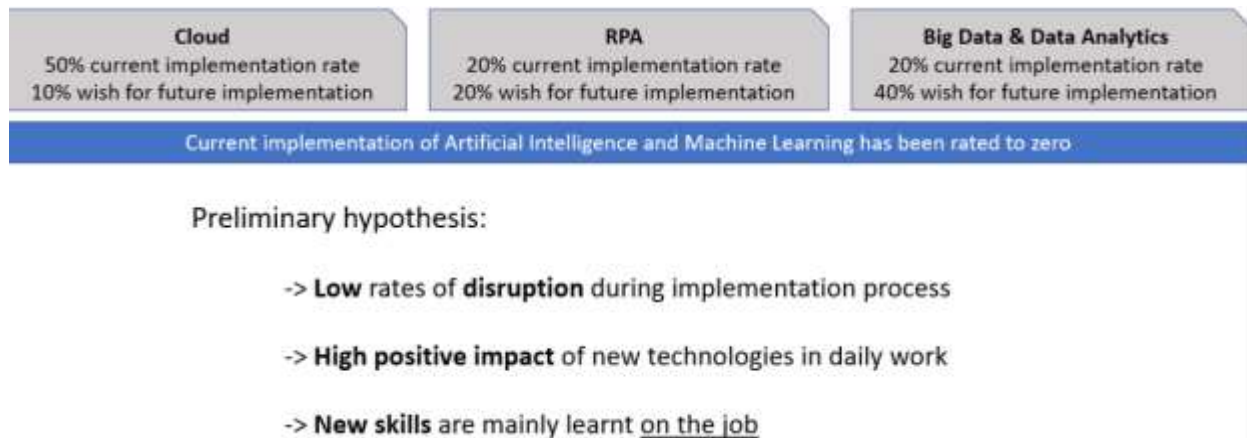

Figure 5. Hypothesis of consolidated responses

As Emmanuel Macron states, it is well known that the digital revolution is a total revolution. It is turning on end the way we produce, consume and work (Arraou, 2016). According to Daugherty & Wilson (2018) it is a misconception to think that machines will gradually replace humans in labour markets. They think the man-versus-machine view is old-fashioned and short-sighted. Instead, we should start to think about it as a collaboration between humans and machines (Kruskopf et all, 2020). To facilitate this symbiosis a small revolution must take place to change the way we learn and change our mentality in the definition of the traditional jobs.

With the purpose of understating the current evolutionary status amongst the accounting practitioners, the research questions are structured in such a way to directly connect to the structure of the Adapted Technology Acceptance Theory.

The research questions are in strict relation with the formulated questionnaire, and it constructs on the adapted TAM theory:

1. What the current level of maturity regarding technology utilisation amongst accounting professionals?

2. How is the behavioural intention to use technology and perceived usefulness related to the degree of current understanding technology?

3. How is the behavioural intention to use technology and perceived usefulness related to the available learning methods?

4. What are the skills required for the future accountants of the "smart" era and what new jobs appeared in the marketplace?

Accordingly, the questionnaire is presented on modules that fit perfectly on the adapted TAM theory:

A.1.	Main area of professional activity ● Accounting ● Audit and insurance services ● Taxation ● Financial Management	
A.2.	Position within the company ● Junior ● Specialist ● Senior ● Team Coordinator ● Other (name it)	
A.3.	Working experience in the accounting area ● 0-3 years ● 4-10 years ● 11-20 years ● 20+ years	
A.4.	Size of your employer company ● No employees ● 1-10 employees ● 11-50 employees ● 51-250 employees ● >205 employees	
A.5.	Gender ● Female ● Male ● I do not want to reply	
A.6.	New technologies implemented within the last 5 years period? e.g. Cloud, Robotic Process Automation, Artificial Intelligence, Machine Learning, Big Data, Data Analytics	
	Yes	No
A.7.	Name the technologies from QA.2. ● Cloud ● Robotic Process Automation ● Artificial Intelligence ● Machine Learning ● Big Data ● Data Analytics ● Other	Which technologies are known to you? ● Cloud ● Robotic Process Automation ● Artificial Intelligence ● Machine Learning ● Big Data ● Data Analytics ● Other
A.8.	On a scale from 1 to 10, rate how confident you are that you master the newly implemented technologies?	On a scale from 1 to 10, rate how confident you are that you could master new technologies?

B   Perceived usefulness

B.1.	Did you find the implementation process disrupting or stress filled? Reply on a scale from 1-10	Do you expect that the implementation process of a new technology would be disrupting or stress filled? Reply on a scale from 1-10
B.2.	Are the consequences of implementing technology visible process wise? Reply on a scale from 1-10	Do you expect visible results after implementing new technologies from a process perspective? Reply on a scale from 1-10
B.3.	Do you feel that using new technologies makes your daily routine easier? Reply on a scale from 1-10	Do you feel that using new technologies would make your daily routine easier? Reply on a scale from 1-10

C   Perceived ease of use

C.1.	On a scale from 1 to 10, rate how easy to UNDERSTAND you find new internet technologies such as Cloud, Robotic Process Automation, Artificial Intelligence, Machine Learning, Big Data, Data Analytics.	On a scale from 1 to 10, rate how easy to UNDERSTAND you find new internet technologies such as Cloud, Robotic Process Automation, Artificial Intelligence, Machine Learning, Big Data, Data Analytics.
C.2.	On a scale from one to 10, rate how easy to LEARN you find new internet technologies such as Cloud, Robotic Process Automation, Artificial Intelligence, Machine Learning, Big Data, Data Analytics.	On a scale from one to 10, rate how easy to LEARN you find new internet technologies such as Cloud, Robotic Process Automation, Artificial Intelligence, Machine Learning, Big Data, Data Analytics.
C.3.	On a scale from one to 10, rate how easy to UTILISE you find new internet technologies such as Cloud, Robotic Process Automation, Artificial Intelligence, Machine Learning, Big Data, Data Analytics.	On a scale from one to 10, rate how easy to UTILISE you think new internet technologies such as Cloud, Robotic Process Automation, Artificial Intelligence, Machine Learning, Big Data, Data Analytics are.

D   Typology of assimilation strategy

D.1.	How did you obtain new skills related to new systems/technologies? ● Self-study; ● Learn on the job; ● Structured courses ● Other	How do you expect to be easier to obtain new skills related to new systems/technologies? ● Self-study; ● Learn on the job; ● Structured courses

E   Confidence in capacity of assimilation

E.1.	On a scale from 1 to 10 rate how well you feel you can assimilate the knowledge required for technology use, taking into consideration the advancement pace of the new technologies?	On a scale from 1 to 10 rate how well you feel you can assimilate the knowledge required for technology use, taking into consideration the advancement pace of the new technologies?	
E.2.	What tools/programs do you think are the best for learning new skills? ● Online courses ● Master`s degree ● Self-study ● On the job training ● Other	What tools/programs do you think are the best for learning new skills? ● Online courses ● Master`s degree ● Self-study ● On the job training ● Other	
F	Behavioral Intention to use		
F.1.	Would you like to learn & use other new technologies within the next 5-year timeframe? Yes/No	Would you like to learn & use other new technologies within the next 5-year timeframe? Yes/No	
	Which technologies would you like to learn? ● Cloud ● Robotic Process Automation ● Artificial Intelligence ● Machine Learning ● Big Data ● Data Analytics ● Other	Which technologies would you like to learn? ● Cloud ● Robotic Process Automation ● Artificial Intelligence ● Machine Learning ● Big Data ● Data Analytics ● Other	

Estimated results and contributions

The 2015 Nobel Prize winner in Economy, Jean Tirole, said: "The digital revolution abounds in opportunities. And regardless of whether we eagerly beckon it in, it will take place, no matter what. Every sector will be affected. It is for this reason that we need to anticipate the many challenges which the digital revolution thrusts at us, so that we can adapt to them, rather than bear their brunt (Arraou, 2016)".

With the current technological emergence towards the smart technology, it is becoming imperative to understand our current position, as accounting professionals, in the great transformational scheme. The paper will try to obtain a view on the current progress and future challenges that the profession will face. For this purpose, an angled approach is being tested to reconciliate the views of the individuals working in the field.

Generally, the methods used are qualitative and quantitative, having a strong base in the existing literature, which is reviewed in depth. The study aims at having a clear deliverable consisting of advices for the current and future professionals in the field of accounting on which would be a good set of skills (referenced to the accounting plus set) that will provide them with a proper competitive advantage in this ever-changing job market.

All in all, the future of the accounting and auditing profession will require a philosophy of lifelong learning and ongoing adaption to the changing environment (Zhang et al. 2018), what is to be studied in this article is merely a drop into the ocean that will be the transformation of the accounting profession.

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