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Juraj Dobrila University of Pula
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Zagrebačka 30, 52100 Pula (Croatia)
+385 (0)52 377-047, fax: +385 (0)52 377-013
e-mail: fet-ric@unipu.hr

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A STUDY OF THE IMPACT OF MANAGERIAL INNOVATION ON SME PERFORMANCE IN AFRICA: THE CASE OF CAMEROON

**Ben Boubakary, Doumagay Donatienne Moskolai,
Gladys Che Njang**

(1) University of Yaounde II - Cameroun,

(2) University of Yaounde II - Cameroun,

(3) University of Bamenda - Cameroon

Ben Boubakary,

University of Yaounde II - Cameroun,

boubakary24@gmail.com

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ABSTRACT

Purpose. *Managerial innovation, if it constitutes a real lever for transformation and performance of companies in developed countries, in Africa, only a tiny part of SME managers make it a priority. At the same time, most African economies continue to be at the forefront of the adoption of global technological innovations. Given the fact that managerial innovation has proven itself in the Western context, and that the context of Sub-Saharan Africa is still unclear, it is important to develop management methods in this context by adapting them to new ones economic models, new objectives, new processes in order to see its impact on improving the productivity and performance of SMEs.*

Design/Methodology/Approach. *A survey instrument based on the questionnaire was used to collect quantitative data to explain the performance of SMEs through the adoption of managerial innovation. For data analysis, multiple linear regression analysis was used.*

Findings and implications. *The findings indicate that, managerial innovation, through its two main components, "change in management practices" and "change in organizational structure", make it possible to increase market share, production efficiency, the bottom line and, in turn, improve the overall performance of the business. Overall, the results of the study show that the fit model is of good quality and can be used to explain the theory.*

Limitations. *The results of this study may not be generalisable to all African SMEs because they are based only on a sub-Saharan African country and the sample size therefore remains small.*

Originality. *The contribution of this article is manifold: it supports the theories of contingency and resource dependence that organizations are adaptive systems that introduce changes to function effectively and improve their performance. Second, it allows SME managers to optimize the chances of sustainability for their businesses, because managerial innovation allows them to: differentiate themselves from their competitors by inventing new offers. Finally, it allows SME managers to no longer confine themselves to the technological aspect of innovation (products, processes) whose lifespan is constantly shortened. Studies of this nature can lead to stimulating managerial innovation in emerging and developing countries, by developing horizontal or networked organizational structures and no longer vertical and pyramidal structures which no longer meet current requirements.*

1. INTRODUCTION

The liberalization of markets and the globalization of trade, with the corollary of the intensification of competition, are having their full impact on organizations, forcing them to use a good strategic sense to stand out of their competitors (Gargouri, 2015). To face this new world order, companies in general, and SMEs, in particular, are called to question a new form of management, better adapted to the need for agility, innovation, but also the fulfillment of employees enabling them to boost their performance: this is managerial innovation. The latter can be defined as a new combination of means, material and conceptual, already existing or new, in the business management process (Gilbert, 1998). For Birkinshaw and Mol (2006), managerial innovation is the implementation of new practices, processes and management structures, which are significantly different from the usual norms. Hamel (2006) considers managerial innovation as a particular contribution to traditional management principles, processes and practices. In a more recent paper, Birkinshaw, Hamel and Mol (2008) define managerial innovation as the invention and implementation of a new practice, process, structure, or management technique. Compared to what is known to better achieve the goals of the organization. It is, therefore, the introduction of a novelty in an organization to improve its performance (Mol and Birkinshaw, 2009).

If this introduction of novelties has become a real imperative for any company, it is more for SMEs when we know that they are vulnerable and have a specific management mode (Julien, 1997), based on the personality of their leader (Quairel and Auberger 2005; Paradas 2006). Moreover, in a constantly changing environment, the performance of any company is now based on this new situation. Various studies have even shown in the past that the failure of African enterprises has various causes (Grégoire 1991, Ouattara 1995, Kamdem 1999), the most important of which is attributed to their lack of innovation. Thus, while in the Western context, companies attach a lot of importance to innovation, the African case remains unclear and does not seem to be a major concern, especially in sub-Saharan Africa (Nkouka Safoulanitou *et al.*, 2013). Yet, it is a source of growth for SMEs, which make up almost the entire business population in Sub-Saharan Africa and contribute more than 30% of GDP (Nkouka Safoulanitou *et al.*, 2013).

Managerial innovation therefore consists of combining business agility and employee freedom, promoting collaboration and cohesion by enhancing collective intelligence and pooling skills, fostering creativity and innovation, and strengthening commitment, a sense of autonomy and responsibilities. Indeed, in a context of crisis like the current one of the Covid-19 pandemic, managerial innovation constitutes, more than ever, an opportunity for SMEs in Africa to reinvent themselves, in particular by becoming more innovative and agile in order to be better adapted to an increasingly complex, uncertain and paradoxical world, but also by responding to a

growing demand from employees who aspire to more “well-being” and “freedom”. African SMEs therefore have every interest in changing their managerial models and reinventing certain practices to better adapt to this new world (Boubakary and Zerbib, 2019; Boubakary, 2020).

The interest in conducting this study within SMEs is no longer to be demonstrated. Indeed, according to RGE (2016), the Cameroonian productive fabric is marked by the predominance of SMEs. In fact, SMEs account for 99.8% of Cameroonian enterprises (79.1% of which are very small, 19.4% of SEs and 1.3% of MEs), which account for nearly 72% of employment and 30% of the country's GDP. SMEs are, therefore, an undeniable factor in creating jobs and wealth.

According to Article 3 of Law No. 2015/010 of July 16, 2015, amending and supplementing certain provisions of the Law No. 2010/001 of April 13, 2010, promoting SMEs in Cameroon, is considered SME, any business, regardless of its sector of activity, which employs at most one hundred (100) people and whose annual turnover excluding taxes does not exceed three (03) billion CFA francs.

Basically, this study aims to understand the impact of managerial innovation on the performance of African SMEs, more specifically those of Cameroon and Nigeria. Managerial innovation seems like a competitive strategy (Haji Karimi, Hamidizadeh, Nasrin and Hashemi, 2013); the determination of its influence on performance may help to reduce the losses related to the lack of such a practice in African SMEs that employ more than half of the active population (Boubakary, Boukar and Tsapi, 2017). In other words, the purpose of this research is to contribute to enriching the empirical knowledge that we have about the role of SME innovation in their performance. The thesis that we want to defend here is that innovation behavior variables, very often used to explain differentiation strategies, can have an important explanatory role in improving the performance of SMEs.

The article is divided into three sections: the first section reviews the various existing works, the second illustrates the methodology of our research and the third presents the results of the study.

2. LITERATURE REVIEW

In this section, we will successively present: conceptual literature on managerial innovation, performance conceptualization and theoretical link between managerial innovation and performance.

2.1. Conceptual literature on managerial innovation

According to the OECD (2005), an innovation is the implementation of a new or significantly improved production of goods or services or processes, a new marketing method or a new organizational method in the practices of a company, the or-

ganization of the workplace or external relations. For Hamel and Breen (2007), there are four forms of innovation: product innovation that involves the design of new or technologically improved products or services. It can be at the origin of considerable development of the organization, but it is easily imitable, process innovation that relates to the production or distribution processes of the good or service. It has an undeniable interest, but spread quickly from one company to another and therefore does not seem to be decisive in terms of competitiveness; strategic innovation, which consists in offering a new economic model, which corresponds to a break that could disrupt competition, but whose identification of the key factors of success remains relatively easy, which prevents from proving decisive; the managerial innovation that is most likely to cause a lasting break. It differs from other forms of innovation because it is based on a complex combination of resources and know-how that is particularly difficult to identify and duplicate for a competitor. However, as part of this study, we will focus on managerial innovation.

Introduced by researchers such as Mintzberg (1973) and Kimberly (1981), who have established the distinction between managerial innovations and other types of innovation, in this case, technological innovation, managerial innovation stands out from others by its propensity to influence the traditional decision-making process of the company. It is considered an organizational means or strategy for managing uncertainty. Thus, for Kimberly, a managerial innovation is defined as *"any program, product or technique that represents a significant distance from the state of management when it first appears and where it affects nature, location, quality or the amount of information that is available in a decision-making process"* (Kimberly, 1981: 86).

For Damanpour (1984), managerial innovation is distinguished from administrative innovation, which is an innovation that influences the social system of an organization, especially the relationships between individuals who interact with one another to accomplish a task or achieve a specific objective. Van de Ven (1986: 591) argues that *"managerial innovation is a new idea that can be either a combination of old ideas, a schema that changes the order of the present, a formula or a unique approach perceived as new by the individuals concerned"*.

For Hamel (2009), managerial innovation is the foundation for creating unique skills for the company. According to the latter, it is the ability to develop managerial innovations that depend on the performance of companies. However, it should be noted that, analysis of the literature on innovation reveals that managerial innovation has several acceptances that are used interchangeably. It is in this sense that Kimberly (1981) argues that managerial innovation is still called organizational innovation. Williamson (1975), Edquist, Hommen and McKelvey (2002) and Sanidas (2005) have used the term administrative innovation. Nevertheless, all the terms used reveal a common sense (Rowley *et al.*, 2011).

Previous works dealing with managerial innovation (Hamel, 2006, Birkinshaw *et al.*, 2008, Damanpour and Aravind, 2011, Vaccaro *et al.*, 2012, Dodgson, Gann and

Phillips, 2013, Phillips, 2013, Hecker and Ganter, 2013, Khanagha, Volberda, Sidhu, and Oshri, 2013), we identified three dimensions: practices, processes, and management structures (Dodgson *et al.*, 2013).

Management practices: For Vaccaro *et al.* (2012), management practices are changes made by managers in what they do as part of their work within the organization, including the introduction of new rules and associated procedures. This can also result from assigning work to someone (i.e. the task) and having to do some work (e.g. function). Birkinshaw *et al.* (2008), Mol and Birkinshaw (2009) explain that management practices refer to what day-to-day managers do in their work (defining objectives and associated procedures, organizing tasks and functions, talent development and satisfaction of different stakeholder requirements). Phillips (2013) defines a managerial practice as a bundle of behavioral routines, tools and concepts to accomplish a certain task. Organizations differ greatly in their eagerness to adopt innovation practices. Also, new practices may lack political, technical or cultural forms making adoption unlikely without adaptation of practice. The adoption of new innovation practices may therefore require careful analysis of the adjustment of new practices and an inappropriate management strategy to ensure broad and high adoption of fidelity those results in maximum benefits. Finally, innovation occurs when individual practices and organizational strategies are integrated into the social structure to support that innovation (Dodgson *et al.*, 2013).

Management processes: According to Hamel (2006) and Birkinshaw *et al.* (2008), management processes refer to the routines that govern the work of leaders, drawing on abstract ideas and turning them into achievable tools, which typically include strategic planning, project management and, among other things, performance evaluation. But Vaccaro *et al.* (2012) focused on how the work is done and include the changes in the routines that govern people's work and the way compensation is set up.

The organizational structure: This is the way companies organize the communication system within them, aligning and leveraging the efforts of their members that feed into the context in which the work is done. These elements are linked to changes in the communication structure as a sign of different ways of doing things, for example, by allowing different groups to exchange information (Vaccaro *et al.*, 2012). Also, the formal structure of the organization could be modified to bring about changes in communication, autonomy and discretion (Hamel, 2006, Birkinshaw *et al.*, 2008).

Managerial innovation, therefore, includes the three facets, the practices that concern what leaders and managers do, the processes that explain how they do it, and the structures that show the organizational context in which the work is done (Hecker and Ganter, 2013). Thus, to implement managerial innovation, it is necessary to introduce a change that reflects a novelty in the way the organization is managed through new practices, processes or structures, including associated techniques (Khanagha *et al.*, 2013). For Hamel (2006), managerial innovation is an innovation

that derogates from traditional management principles, processes and practices that change the way work is done. Managerial innovation, therefore, consists of a set of rules and work routines that are done within organizations (Birkinshaw *et al.*, 2008; Damanpour and Aravind, 2011).

For Le Roy *et al.* (2013), managerial innovation is the adoption, by an organization, of new management practices or methods for it, to improve its overall performance. This definition encompasses two meanings of the concept: "(1) *managerial innovation is the invention and adoption by an organization of a completely new management practice or method about known management practices and methods; the organization develops an innovation and implements it first; the success of this organization, because of this managerial innovation, leads other organizations to adopt it; (2) managerial innovation is the adoption by an organization of a management practice or method that already exists but is new in relation to its current management practices and methods; the organization does not develop innovation and is not necessarily the first to adopt it; it is the success of the organizations that have adopted this managerial innovation that has led it to adopt it as well*" (Roy *et al.*, 2013, p.85). In this study, we will retain these two definitions of managerial innovation. This choice is justified by the fact that they seem to be more appropriate, because the managerial innovation, beyond being an invention of a new practice or method of management by an organization, is also the adoption of a practice or management method already existing but new for the organization adopting it.

2.2. Performance conceptualization

Business performance is a central concept in management science that many researchers have sought to define for more than four decades (Couret, 2011; Marmuse, 1997; Bouquin, 1993; Lawrence and Lorsch, 1973). The term performance is widely used, although its definition is not unanimous (Bourguignon, 1995). According to Marmuse (1997), the performance of an organization is the way it is organized to achieve its objectives. For Lawrence and Lorsch (1973), the performance of the organization translates its capacity to satisfy the requirements of the environment which includes actors who realize market relations with the organization (the providers of resources necessary for its activities and the clients) but also the community in its broad sense which is located outside the market. For Bouquin (1993), performance does not exist intrinsically, but in relation to users.

Historically, corporate performance has been measured by financial indicators (Neely, 1999; Walker and Brown, 2004), which are considered objective and reliable and easily interpreted for evaluation or benchmarking purposes. However, since the mid-1980s, many critics have been raised about financial measures as performance indicators, notably due to: their short-term orientation, their lack of link with the strategy (Neely, 1999) , their inability to consider the interest of the various stakeholders and their tendency to want to "normalize" behaviors, which is far from ac-

counting for the reality and heterogeneity of SMEs (St-Pierre and Cadieux, 2011).

Several types of performance modeling are widely used in management science literature. The models most cited by this literature are those of Quinn and Rohrbaugh (1983), of Morin *et al.* (1994) and de Bourguignon (1996). Each of these models takes a different look at performance but is unanimous on the multidimensional aspect of this concept. By referring to the theory of Stakeholders or Stakeholders (Freeman, 1984), it is, in fact, possible to interpret the performance according to the challenges of the different actors who make up the organization or who hold an interest in it. For some, the financial or accounting dimension will be predominant while for others, the consumer-product, socio-political or even employment dimension will be significant (Le Louarn and Wils, 2001). In this perspective, Dyer and Reeves (1995) proposed different types of performance level indicators, the most used of which are four: 1) the results of human resources such as absenteeism, turnover, satisfaction at work and the performance of the individual and the group; 2) organizational results such as productivity and quality of products and services; 3) financial results such as return on assets (ROE) and returns on investment (ROI); 4) market efficiency (Tobin stock price or Q which is the ratio of a firm's market value to the cost of replacing its assets).

Other authors, such as Kalika (1988), Bayad and Liouville (1998), have distinguished three dimensions for measuring the performance of organizations. First, the social dimension of performance, which is broken down into four indicators: work performance, working time, staff capacity to perform tasks and absenteeism. Second, the organizational dimension of performance which is made up of three indices: productivity, innovation and quality. Third, the economic dimension of performance, which is measured using four items: profitability, sales growth, market share and customer loyalty.

Ultimately and as Louart (1996) pointed out, in its plurality of meanings, performance is based on multiple benchmarks: economic (profitability, competitiveness), legal (legal compliance, solvency), organizational (skills, consistency and efficiency) or social (involvement, satisfaction, quality of life at work). In the context of this study, we consider performance in a global manner, which is to say through its three essential dimensions, namely: the economic dimension, the social dimension and the organizational dimension. The advantage of these three indicators is that they are easily observable. Also, as we work in SMEs, it seems more realistic to combine them.

Once the concept of performance has been identified, we will now dwell on the theoretical link that may exist between this concept and managerial innovation.

2.3. The theoretical link between managerial innovation and performance

Used for the first time by Kimberly in 1981, the term "*managerial innovation*" is motivated by a desire to recognize innovations that have been neglected so far and are not technological (Le Roy *et al.*, 2013). Indeed, public authorities, companies, managers and researchers have always focused most of their attention on technological innovation. They have shown little interest in other forms of innovation, such as managerial innovation (Le Roy *et al.*, 2013). In fact, managerial innovation, its context and innovation process, its innovator and its effect on the performance of companies in general, and SMEs in particular, are very unpopular. Yet, according to Le Roy *et al.* (2013), managerial innovation is the main factor that explains the company's performance.

For Van Auken *et al.* (2008), managerial innovation can lead to increased market share, greater efficiency of production, higher productivity growth, and increased bottom line. Managerial innovation thus enables SMEs to adopt new practices in order to differentiate themselves from their competitors and improve their financial performance (Zahra *et al.*, 2000). Indeed, according to the latter, managerial innovation enables SMEs to obtain higher financial performance by offering a greater variety of products (precious, rare, inimitable and differentiated). For Keizer *et al.* (2002), managerial innovation is one of the most important ways in which SMEs can compete and perform well. In the same vein, Barney (1997) pointed out that SMEs can gain a sustainable competitive advantage through their managerial innovation.

According to Zhu, Zou and Zhang (2019), the implementation of CSR practices is a form of managerial innovation for SMEs that helps improve their performance. In the same vein, Arnold (2017) emphasizes that SMEs that place greater emphasis on managerial innovation, such as CSR, have a great capacity to improve their performance. Bocquet *et al.* (2017) also argue that managerial innovations such as CSR may be necessary for SMEs with strategic objectives to improve their performance, such as growth. Thus, managerial innovation is a key lever for Cameroonian SMEs to improve their performance through CSR practices. For Mattera and Baena (2015), managerial innovation can interact with CSR practices that improve performance. Adam, Strahle and Freise (2017) also confirm that managerial innovations, such as the implementation of a management system, interact with CSR practices in order to improve the performance of SMEs.

Managerial innovation based on market orientation and organizational learning, therefore, has a significant impact on the company's performance (Besbes, Aliouat and Gharbi, 2013). According to the latter, the market orientation is an information resource and learning, an organizational resource, and both, as dynamic capacities crucial for the development of the company's competitiveness, have a significant impact on the competitive advantage and SME performance. The authors

thus combine the resource-based strategic approach of the firm that the true source of competitive advantage and higher performance lies in the specific resources of the firm and not in the unique positioning of the firm at the market level (Barney, 2001); and the capacity-based approach of Helfat and Peteraf (2003) for whom an organization's ability to perform a set of tasks in a coordinated manner using organizational resources achieves a particular goal, including performance.

According to Birkinshaw *et al.* (2008), managerial innovation that is seen as the creation and application of a renewed management practice, process or technique achieves organizational goals such as performance. In the same vein, Mol and Birkinshaw (2009) note that managerial innovations, which are typically incremental and include new approaches to structuring the firm, new management techniques, and new marketing methods, have only one ultimate goal, which is that of improving the company's performance. However, Walker *et al.* (2010) find that the relationship between managerial innovation and performance is subject to the organization's ability to put in place management systems, effectively manage organizational processes, and implement its mission and strategies. Such a relationship first requires a competitive advantage by referring to Hunt's "resource-benefit" theory (1999), which conceptualizes the relationship between resources, competitive advantage and superior performance.

For some authors (Adams, John and Phelps 2006; Birkinshaw *et al.*, 2008), managerial innovation, about product/service innovations, is generally intended to increase the efficiency and effectiveness of internal business and administrative processes of the organization. It can include changes in structure, management systems, knowledge used to perform management work and management skills that enable an organization to function effectively and efficiently (Hamel, 2006). Thus, managerial innovation translates the adoption of new management systems and processes to make management work more efficient, but also the use of new management and information systems to improve the efficiency of systems and processes. The organization's operating performance increases the company's performance (Damanpour, Walker and Avellaneda, 2009). The combined effect of introducing new practices, processes and techniques to improve the organizational adaptation and effectiveness that management innovation conveys enables the company's performance to be achieved. This view is championed by proponents of theories of contingency and resource dependence that organizations are adaptive systems that introduce changes to function effectively and improve their performance (Lawrence and Lorsch, 1967; Pfeffer and Salancik, 2003).

Managerial innovation plays a central role in the process of organizational change, facilitating the adaptation of organizations to the external environment and increasing the efficiency and effectiveness of internal processes (Walker *et al.*, 2010). Boyne and Walker (2002) indicate that managerial innovation, such as total quality management, has positive consequences for performance. Ndalira, Ngugi and

Chepkulei (2013), in their studies in Kenya, report empirical evidence that managerial innovation has a strong link to sales performance. Indeed, for these authors, the tendency of owners to engage in new ideas, new practices, creative processes, results in new products, services or technological processes that have a great influence on the performance of SMEs. However, proponents of the institutional theory suggest that managerial innovation can have indirect effects on performance because the factors driving adoption are initially focused on ensuring internal and external legitimacy (Staw and Epstein, 2000). Nevertheless, like the majority of previous work, we consider that managerial innovation, which induces changes in the management processes of SMEs, positively and significantly influences their performance.

In view of all the above, we formulate the hypothesis according to which, managerial innovation, through its different facets (changes in management practices, in management processes and in organizational structure), positively influences Overall Performance of SME.

3. METHODOLOGY

To provide some answers to the problem stated in this research, this study combines the theory of resources and capabilities, thus bringing them closer to the performance of SMEs. The methodological elements presented in this work concern the measurement of variables, the characteristics of the sample and the collection of data as well as the statistical tools used.

3.1. Measuring variables

To measure managerial innovation, we adapted the measurement scales resulting from the work of Birkinshaw *et al.* (2008) and Le Roy *et al.* (2013), namely: (1) Implementation of a new structure to manage technological innovations and facilitate process and product innovations; (2) Establishment of a new organizational structure to manage multiple products and markets; (3) Implementation of a new production management method that improves efficiency and reduces lead times; (4) The practice of a new method to reduce quality defects and increase customer satisfaction; (5) The adoption of new costing techniques that are more realistic; (6) The adoption of a new method to integrate information of a different nature necessary for the decision; (7) Implementation of a new structure allowing the launch of complex and innovative products; (8) Establishment of a new structure allowing problem solving by employees; (9) Establishment of a new structure to facilitate coordination between the different functions and the project type organization. These items are measured by the 5-point Likert scale, ranging from "1 = strongly disagree" to "5 = strongly agree".

Regarding the measurement of overall performance, we have selected three dimensions (each of which includes two indicators) to understand this concept, name-

ly: the economic dimension (asset profitability and financial profitability); the social dimension (social climate and quality of life at work) and finally the organizational dimension (cost control and stakeholder satisfaction (customers, suppliers, employees, investors, etc.)) over of three years. Financial indicators are measured using a three-point Likert type scale: "1 = decline; 2 = stable; 3 = rise. The social climate was also measured using a three-point scale: "1 = bad; 2 = good; 3 = very good.

Also, we took into account in our analyses several control variables suggested by Kim, Cable and Kim (2005). These are the size of the business, its age, industry and type of respondents. Indeed, these authors suggest that the control variables retained must make sense conceptually. As a result, the literature analysis led us to include four control variables in the model to be tested.

The company's performance has indeed been correlated with gender (Bauwer-aerts *et al.*, 2017; Dang *et al.*, 2017 and Garnero, 2017), with men-led SMEs generally performing better than women-led ones. The size of the enterprise has also been measured because it is likely to influence performance, as the larger the enterprise, the more its structure offers standardized procedures and differentiated work methods, and more it is likely to perform well (Mlouka and Sahut, 2008, St-Pierre, Julien, and Morin, 2010). The relationship between age and the performance of business would be positive (St-Pierre, Julien and Morin, 2010). With age, the increase in experience is concomitant with that of the competitive advantage, which increases the profitability of the company. We controlled the business sector, whether industrial, commercial or service. This distinction appeared necessary because Moati (2000) and Issor (2017) point out the diversity of performance from the sector of activity. Indeed, SMEs are not a homogeneous category, but a convenient name which designates a diverse reality likely to be differentiated by the sector of activity, by the technological degree of their productive system, but also their appreciation of the performance indicators.

3.2. Characteristics of the sample and collection of data

Initially, our investigation consisted of 180 companies from the reference population (identified in a file of 203,482 companies, including 6,055 companies in Ngaoundéré, 6,789 companies in Garoua, 6,870 companies in Maroua, 49,970 companies in Yaoundé and 70,082 companies in Douala) (RGE, 2016). A non-probabilistic sample, more precisely by reasoned choice, given the growing insecurity in certain regions of the country, particularly the Far North, North West, West, and South West where the phenomena of Boko Haram and separatists (or secessionists) have made life impracticable and the environment inaccessible in these localities of the country. Moreover, according to RGE (2016), the five cities account for nearly 75% of the country's enterprises, where Douala and Yaoundé remain the main economic centers of the economic units, with respectively 37% and 27%. Also, these five

cities are representative of the different layers of the population of the national triangle, where the cities of Ngaoundere, Garoua and Maroua represent the far north; Yaounde, the great south and Douala, the great west.

However, after eliminating the non-workable questionnaires and non-responses, we finally obtained a sample of 163 companies. That is a response rate of almost 91%. For the most part, we administered the face-to-face questionnaire to managers of SMEs, because we also wanted to have interviews with them. However, we did not receive a favorable welcome from all doors. The usable questionnaires collected in the five Cameroonian cities are presented in Table 1. below.

Table 1.: Report on the administration of the questionnaire

Cities	Frequency	Percentage	Cumulative percentage
Ngaoundere	26	15.95	15.95
Yaounde	33	20.25	36.20
Douala	47	28.83	65.03
Garoua	37	22.70	87.73
Maroua	20	12.27	100.0
Total	163	100.0	

Source: Authors.

Beyond the geographical aspect, our sample is characterized by other elements, as shown in Table 2. below.

Table 2.: Characteristics of SMEs studied

Characteristics studied	Response modalities	Frequency	Percentage
Age range of the leader	Under 35	71	43.6
	35 years and over	92	56.4
	Total	163	100.0
Level of studies	Primary	32	19.6
	Secondary	68	41.7
	University	63	38.7
	Total	163	100.0
Business sector of the company	Trade	52	31.9
	Industry	63	38.6
	Service	48	29.4
	Total	163	100.0
Type of respondent	Male	102	62.6
	Female	61	37.4
	Total	163	100.0
Employee number (company size)	0 to 49	89	64.6
	50 to 100	74	45.4
	Total	163	100.0

Source: Authors.

It emerges from this Table 2. that two age groups are displayed among the leaders of our sample. That of managers aged 35 and over being the majority (56.4%) compared to those under 35 years of age. Also, many of the leaders in our sample have a secondary level of education (41.7%). Those with a university-level represent 38.7% of the companies in our sample. Only 19.6% of leaders have a primary level of education. However, one should be cautious in interpreting these results because there is a risk of bias due to inaccurate responses provided by respondents. Indeed, it is difficult for a leader to accept that he has a degree less than the Baccalaureate. This is what would justify the low rate of leaders with a level of primary education. However, this result shows that the entrepreneurial landscape of SMEs in Cameroon is heterogeneous according to the level of study, and dominated by individuals with secondary education. In addition, the companies in our sample belong to three sectors of activity, namely: the industrial sector which constitutes the majority of the companies in the sample (38.6%), the commercial sector (31.9%) and the services that come as a last resort (29.4%). Also, the sample shows that male leaders (62.6%) outnumbered females (37.4%). This confirms the idea that men hold a more important place than women on the business scene in Cameroon. Finally, we have a heterogeneous sample of the bridge of view of the size of firms. Indeed, 64.6% of the companies in our sample are small businesses, 45.4% are medium-sized enterprises. If we see this predominance of small businesses, this confirms the view that the Cameroonian entrepreneurial landscape is dominated by small businesses. Of course, very small businesses are numerous, even though they are hard to find on the formal stage, whereas we have the formal framework as a sampling base.

3.3. Statistical tools used

In the framework of this study, we have judged econometric modeling via the linear regression technique. This choice is justified by the fact that our dependent and independent variables are variables with the same measurement levels (metric/metric). The principle consists in integrating into the same regression the independent variables (CMP and COS) and the control variables (size and sector of activity).

As a reminder, the modeling makes it possible to highlight the existence of an association (between the explanatory variables and the explained variable) by a robustness test and measurement procedure. The most commonly used association measure is the Pearson correlation coefficient. The objective pursued by regression analysis is to determine the value of the parameters β_i , making it possible to identify the link between the dependent variable and the independent variable. The linear regression method is based on the following statistical indicators:

The correlation coefficient (R) which indicates the intensity of the relationship between the variables studied and its value is between -1 and 1 (this value is good when it tends to 1 in absolute value);

The coefficient of determination (R^2) which is the usual indicator of the overall quality of fit. It measures the percentage of the variance of the variable to be explained returned by the model; its value is between 0 and 1 (this coefficient is interesting when it is close to 1);

The t of Student, which measures the significance of the regression coefficients of the model, is significant when its value is greater than two;

The Fisher-Snedecor test that measures the robustness of the model at the 0.000 level of significance.

The equation of the estimate of our regression model can be as follows:

$$OPC = \alpha + \beta_1 \cdot CMP + \beta_2 \cdot COS + \beta_3 \cdot AGE + \beta_4 \cdot SIZ + \beta_5 \cdot SEC + \beta_6 \cdot SEX + \varepsilon \quad (1)$$

OPC: the Overall Performance of the Company;

CMP: the explanatory variable "Change in Management Practices";

COS: the explanatory variable "Change in the Organizational Structure;

AGE: a control variable expressing the age of the enterprise;

SIZ: a control variable, measured by the size of the firm;

SEC: a control variable, measuring the business sector of the enterprise;

SEX: a control variable expressing the sex of the respondent;

β_1 to 6: the coefficients of the variables involved;

ε : the error term of the model;

α : the constant.

4. FINDINGS

Here, we are talking about presenting our main results, namely: verifying the validity of measurement scales, matrix of correlation of variables and regression analyzes.

4.1. Verifying the validity of measurement scales

Verification of the validity and reliability of the measurement scales used in this study was carried out using principal component factor analysis under SPSS.20 software. The results of these analyzes are recorded in the various measures in Table 3. below.

Table 3.: Factor Analysis of Managerial Innovation

<i>Items</i>	Components		<i>Commonality</i>
	F1	F2	
Implementation of a new production management method that improves efficiency and reduces delays (V1)	0.982		0.966
The practice of a new method to reduce quality defects and increase customer satisfaction (V2)	0.980		0.963
The adoption of new costing techniques more realistic (V3)	0.977		0.855
The adoption of a new method to integrate information of a different nature necessary for the decision (V4)	0.959		0.843
Implementation of a new structure to manage technological innovations and facilitate process and product innovations (V5)		0.939	0.838
Establishment of a new structure to facilitate coordination between the different functions and the project type organization (V6)		0.925	0.833
Establishment of a new organizational structure to manage multiple products and markets (V7)		0.913	0.825
Implementation of a new structure allowing the launch of complex and innovative products (V8)		0.907	0.815
Establishment of a new structure allowing problem solving by employees (V9)		0.812	0.759
Own values	3.809	2.386	-
% variance explained	51.414	30.551	-
% cumulated explained variance	51.414	81.965	-
Cronbach alpha coefficient	0.809	0.794	-

Source: Authors.

Managerial innovation is apprehended using a battery of nine items. The KMO has a value of 0.794 (> 0.5) and can be considered satisfactory. Similarly, the Bartlett sphericity test result of 639,438 at the 0,000 significance level indicates that the correlation matrix is not unitary. Given these two elements, the CPA is relevant to our data. The results in Table 3. reveal two factors, each of which has an own value greater than 1. And both factors return the information to 81.965% of the total variance. On the other hand, the internal coherences of these two factors are satisfactory about their Cronbach alpha coefficient. It thus emerges that the concept of managerial innovation is two-dimensional since it has two relevant dimensions. The first is represented by the first factorial axis (F1), which is strongly correlated with variables V1 to V4. The second, represented by the second factorial axis (F2), is strongly correlated with variables V5 to V9.

It can be inferred that the first factorial axis represents the "change in management practices" that we call CMP. In contrast, the second factorial axis represents the "change in organizational structure" that we call COS.

Table 4.: Result of factor analysis on the overall performance concept

<i>Items</i>	<i>F1</i>	<i>Commonality</i>
Cost control	0.964	0.928
Quality of life at work	0.958	0.918
The profitability of the assets	0.943	0.909
Financial profitability	0.938	0.877
Stakeholder satisfaction	0.923	0.873
The social climate	0.917	0.858
Own values	4.734	-
% variance explained	84.570	-
% cumulated explained variance	84.570	-
Cronbach alpha coefficient	0.851	-

Source: Authors.

After analyzing the Pearson correlations between the items constituting the overall performance, it emerges that these (items) are not orthogonal since there are significant correlations between them. This led to an ACP to identify the relevant but hidden dimensions of the concept. The results of the analysis, contained in Table 4. above, are satisfactory. Indeed, the KMO index and the Bartlett sphericity test give a value of 0.864 and 1284.631, respectively, at the significance level of 0.000. This shows that the structure of the correlation matrices for the data of the study sample lends itself well to the PCA. This analysis retains, according to Kaiser's principle, a single factor. All variables have a commonality greater than 0.5. The value of Cronbach's alpha for this factor is satisfactory since it is greater than 0.65, which is the minimum threshold, which reflects acceptable reliability of the scale used for measuring overall performance.

4.2. Matrix of correlation of variables

Multivariate analysis through the study of correlations indicates that there is no problem of multicollinearity between the independent variables of the model since the correlation coefficients between the explanatory variables are all less than 0.7. Indeed, the presence of the multicollinearity problem is a sign of redundancy of information in the model and deteriorates its quality. Reading Table 5. leads to the observation that all the partial correlation coefficients are low (all between 0.1 and 0.7) and significant (at the 5% threshold). According to Anderson *et al.* (2015), there is a presumption of multicollinearity when a correlation coefficient between two independent variables is greater than 0.70 (or lower -0.70). Overall, the different explanatory variables are positively correlated with each other and below 0.70 (Table 5.). These weak correlations significant at the 5% threshold illustrate a prediction made on the measures of managerial innovation. Similarly, while admitting that the

sex of the leader can be a confounding factor, the analysis following the gender aspect shows that the different dimensions of managerial innovation are positively correlated regardless of age, size, sector of activity and sex and with a value less than 0.7. These weak correlations at the 5% threshold suggest that there is no great disparity between the managerial innovation of small and medium-sized enterprises, industrial sectors, trade and service, elderly or otherwise, led by a man or woman.

Table 5.: Correlations between the different explanatory models

Variables	1	2	3	4	5	6
1. CMP	1.000					
2. COS	0.140	1.000				
3. AGE	-0.044	-0.041	1.000			
4. SIZ	-0.014	-0.031	-0.021	1.000		
5. SEC	-0.022	-0.021	0.043	0.651	1.000	
6. SEX	-0.041	-0.021	0.022	0.691	0.132	1.000

Source: Authors.

4.3. Regression analyzes

The analysis of the results (carried out under EVIEWS 9) of Table 6. shows that the coefficient signs of the GPC and CSO variables are positive. The same is true of the student's t exam, which reveals the significance at the 1% level of these two variables. In addition, the overall quality of the estimate is satisfactory. In fact, the results show a Fisher statistic with a value of 76.186 and the associated probability is 0.000 (strictly less than the 5% significance level). We reject the null hypothesis in favor of the alternative hypothesis. Thus, the model is globally significant and of good quality. In fact, as the adjusted R^2 value is equal to 0.7997, this means that 79.97% of the overall performance of SMEs is explained by managerial innovation. Also, since adjusted R^2 is less than DW (0.7997 > 2.545), according to Granger in 1983 and Engel in 1987, we can safely say that our regression model is correct.

For control variables, the results show a positive and significant effect at the 5% threshold of all control variables on the overall performance index, except the EGM. It can thus be noted that the age of the company has no significant influence on the overall performance of the company, even though the experience conditions are satisfied by this variable. The company's performance does not increase with age. However, "gender", "size" and "the business sector" significantly influence the overall performance of SMEs. Thus, men-led SMEs seem to perform better than women-led ones, and overall performance increases with "size" and depends on the sector

of activity (that is, industrial SMEs are more likely to performers than SMEs in other sectors).

The econometric equation of the estimated final model can therefore be written as follows:

$$OPC = 0.587719 + 0.831641 \cdot CMP + 0.846104 \cdot COS + 0.364935 \cdot AGE + 0.628661 \cdot SEC + 0.034624 \cdot SEX + \varepsilon \quad (2)$$

Table 6.: Results of the regression analyzes

Dependent Variable: OPC Method: Least Squares Sample: 1 163 Included observations: 163				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.587719	0.046307	12.69193	0.2684
CMP	0.831641	0.055083	15.09809	0.0000
COS	0.846104	0.052314	16.17372	0.0000
AGE	-0.035225	0.040352	-0.872926	0.3847
SIZ	0.364935	0.089104	4.095612	0.0001
SEC	0.628661	0.070699	8.892119	0.0000
SEX	0.034624	0.041047	0.843516	0.0408
R-squared	0.810323	Mean dependent var		0.587719
Adjusted R-squared	0.799687	S.D. dependent var		0.494418
S.E. of regression	0.221284	Akaike info criterion		-0.119307
Sum squared resid	5.239404	Schwarz criterion		0.048705
Log likelihood	13.80048	Hannan-Quinn criter.		-0.051120
F-statistic	76.18629	Durbin-Watson stat		2.545456
Prob (F-statistic)	0.000000			

Source: Authors.

5. DISCUSSION

The results obtained allow us to make several observations, including their scope and limits to guide future research. The results of the regression analyzed show that managerial innovation is positively associated with the overall performance of SMEs. These results are similar to those obtained by a number of authors, notably those of Van Auken *et al.* (2008), Birkinshaw *et al.* (2008), Damanpour *et al.* (2009), Walker, Damanpour and Devece (2010), Alzuod and Kharabsheh (2015), Maalej and Amami (2016), in their study aimed at understanding the influence of managerial innovation on business performance. Thus, the adoption of new innovative management practices and the change in the organizational structure within SMEs improve their overall performance.

This confirms once again the role played by innovation in value creation and improving business performance. As a result, Cameroonian SMEs can improve their overall performance through the implementation of new management practices, methods or techniques, new ideas and organizational structure. However, unlike previous work that looked at performance from a financial or organizational point of view, in the context of this study, we appreciated it from a global perspective. The differences observed in the regression coefficients compared to previous work can be attributed to the performance indicators used, but also to the effect of the sample size.

This study also found two dimensions of managerial innovation (management practices and organizational structures) having a positive and significant influence on the performance of companies, contrary to previous work that found three (management practices, management processes and organizational structures) (Alzuod and Kharabsheh, 2015). This difference can be explained by the nature, quality and number of items used to apprehend managerial innovation. Indeed, Alzuod and Kharabsheh (2015) used fifteen items to measure this concept, unlike us who only used nine.

Thus, these results once again show the value of managerial innovation in companies. Indeed, during periods of crisis such as that of the Covid-19 which is currently raging in the world, SMEs that will not be able to carry out innovative managerial practices will be forced to shut down. However, the high explanatory power (79.97%) obtained in this study should be with some reservations. Indeed, there are generally internal brakes (lack of financial, technical and human resources, time) and external (obtaining information, raw materials, financing, risk perception, limits of domestic and foreign markets, government regulations, actions, policies, etc.) linked to the process of adopting an innovation (Damanpour and Aravind, 2012).

However, it should be noted that the results of this study could, in part, be explained by the African cultural context, in general, and Cameroonian, in particular. Indeed, favorable managerial practices in Africa such as tontines and respect for African values centered on family, community, work, can contribute to the performance of companies and justify the high explanatory power of our model. Thus, to better implement managerial innovation, it is important to take into account the local culture in order to see whether it is favorable or not to its implementation. In fact, unlike Western organizations which are more individualistic and driven by excessive capitalism, the community spirit is rooted in the habits of African societies. This state of affairs, which facilitates the sharing of professional experiences and the transfer of skills, is likely to promote managerial innovation and, therefore, generate economic or social performance.

6. CONCLUSION

At the end of this study, which aimed to analyze the influence of managerial innovation on the performance of SMEs in Cameroon, we are convinced that managerial innovation, as most of the literature presents, is a lever of performance in that, it allows the implementation of new management practices which, until now are little or no explored by the company and which allow to increase the market share, the effectiveness of the production, net results and, in turn, improve the overall performance of the company.

Empirical analyzes have shown that, in the Cameroonian context, managerial innovation is two-dimensional (innovation in management practices and innovation in the organizational structure) and the combination of these different dimensions has a positive and significant effect on the performance of SMEs in these regions of Cameroon. This ability of SMEs to develop a managerial innovation is therefore an internal force that produces change in the company, facilitating the adaptation of the company to the external environment and increasing the efficiency and effectiveness of internal processes. This is reflected in the implementation of new products, services or technological processes that have a great influence on the performance of SMEs.

On the theoretical level, the direct links between managerial innovation and overall performance are rare in the literature, therefore this research fills this gap by bringing additional results: previous studies having apprehended the organizational or financial performance of companies, we have broadened our vision in this field to the notion of overall performance, taking into account both the economic dimension (profitability of assets and financial profitability); the social dimension (the social climate and the quality of life at work) and finally the organizational dimension (cost control and stakeholder satisfaction (customers, suppliers, employees, investors, etc.)). Also, if managerial innovation was considered until then as a vague and abstract concept, because it was not sufficiently operationalized to capture its various components, the present study makes it possible to overcome this limit, distinguishing the two essential dimensions of managerial innovation, given the scarcity of empirical work that has operationalized this concept.

In addition, this study supports theories of contingency and resource dependence, according to which organizations are adaptive systems that introduce changes to function effectively and improve their performance. Indeed, our contribution lies in the fact that the study explains by the managerial action of the valuation of so-called strategic assets that allow creating value of the firm. Indeed, according to resource dependency theory, the enterprise must focus on a minority of the resources that have the characteristic of being of value, rare, difficult to imitate and substitute, and thus ignores other resources that do not fulfill any of these conditions. However, in this study, we have apprehended managerial innovation as a strategic resource enabling the company to perform well.

On the managerial level, our results showed the importance of SMEs to develop managerial innovation to guarantee their performance. To remain efficient, SMEs must implement innovation their management practices and their organizational structure. This study will thus enable SME managers to optimize the chances of their companies' sustainability because managerial innovation is for them a source of creativity enabling them to: differentiate themselves from their competitors by inventing new offers that "*surprise and delight*" More and more demanding and volatile customers; to be agile in order to adapt to permanent changes in their environment; to acquire the flexibility and responsiveness necessary to face future challenges; Attract and retain committed employees who are passionate and eager to contribute to the success of their business. Moreover, this study will allow SME managers to no longer be limited to the technological aspect of innovation (products, processes) whose lifespan is constantly shortened by the evolution of science and technology, but also to grasp the managerial aspect that allows them to develop a horizontal or network organizational structure and no longer on vertical and pyramidal structures; to increase their capacity for innovation and promote happiness at work.

While this study has contributed to an understanding of the influence of managerial innovation on the overall performance of SMEs, it has some limitations. The first limit is to have wanted an essentially explanatory study. It offers few tools within reach of managers to make strategic decisions. Indeed, our choice to carry out, exclusively, a quantitative study based on the administration of the questionnaire, do not allow us to have more details and understanding of the studied phenomenon, compared to a qualitative study based on semi-annual interviews directive (Gavard-Perret *et al.*, 2012). The second limitation of this search is the sample size that can be considered low. Indeed, although the sample in this study is statically acceptable (> 30), it is nevertheless limited. This could affect the accuracy of the results and leave some doubts about the generalization of the study to all Cameroonian SMEs.

Also, much remains to be done to improve our knowledge of the links between managerial innovation and the overall performance of SMEs in Cameroon. Intuitively, one can imagine that cultural specificity plays, despite everything, an important role in understanding the performance of SMEs. It would be interesting to take this factor into account to improve the quality of our results. A qualitative exploratory study with companies from different countries could also identify best practices for managerial innovation that can create value. Similarly, it would be particularly stimulating to question the existence of a business climate that could, more or less strongly boost the managerial innovation within SMEs.

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THE PERCEIVED VALUE OF HIGHER EDUCATION AND UNIVERSITY COMPETITIVENESS –THE RUBIK CUBE METAPHOR

**Costinel Dobre, Gheorghe Preda, Anca Milovan, Remus
Ionut Naghi, Sorin Ioan Prada**

(1, 2, 3, 4, 5) Marketing and International Economic Relations Department,
West University of Timisoara, Romania,

Costinel Dobre
Marketing and International Economic Relations Department,
West University of Timisoara, Romania,
costinel.dobre@e-uvt.ro

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ABSTRACT

Purpose. *Over the past two decades, concerned with how stakeholders perceive the value of their services, universities have adopted entrepreneurial orientations and relationship marketing approaches into their activities. The fierce competition on the global higher education market, forced university managers to innovate, to look for new ways to build their offer. Relationship marketing and the knowledge regarding the stakeholders, primarily the students' perception of their offerings, can provide universities with a competitive advantage. As such, university managers need to carry out satisfaction surveys, inquiries regarding the universities image or the perceived value of the academic programs and services offered, need to plan and organize offline and online integrated marketing communication campaigns.*

Methodology /Design/Approach. *Based on the resemblance of perceived value with a Rubik's cube, university marketers can constantly innovate through the way they match the various dimensions of perceived value or facets of the cube to meet the stakeholders' expectations.*

Result /Findings. *This research highlights the dimensions of the perceived value of the educational offer and determines the extent to which factors such as the university image, the source of financing the studies and the duration of the student - university relationship have an influence on the perception of value. For this purpose we conducted a quantitative research on a sample of 320 students from the largest faculty from the West University of Timișoara, Romania. To perform the statistical data analysis, the following steps were carried out: (1) the reliability of the measurement scales analysis; (2) the opportunity to perform the factorial analysis verification; (3) the exploratory and confirmatory factor analysis and (4) the research hypotheses testing. Research results showed that the perceived relational value affects the student's perceptions on the quality of learning, the usefulness and quality of the acquired knowledge, the employment opportunities. The institutional image has a positive influence on the perceived value of the educational offer. For university or faculty managers, it is important to know how to combine the various facets of the perceived value-technical value, relational value, social value, temporal value- in order to provide the value expected by their stakeholders, primarily by students*

1. INTRODUCTION

Over the past 25 years, the educational sector in Europe has suffered major changes which have led to the intensification of competition. The (1) Bologna Agreement application that led to increased student mobility in the European superior education space and to an increased offer transparency; (2) reduction in the number of students due to demographic issues; (3) economic issues, especially the budgetary restrictions tightening, are among the factors that contributed to the present situation.

In Central and South-Eastern European countries, such as Romania, the pressure put on managers in the education sector is even greater for two reasons: (1) high school graduates apply for admission at universities in Western Europe; (2) the migration of young families to countries such as Germany, Italy, Spain, UK, etc. looking for jobs, which reduces the selection pool for universities in this geographical area.

These factors provoked turbulences into the market and increased the educational sector managers' competitiveness in finding ways to attract and retain students. According to Štimac and Šimić (2012), the main goal of increasing the competitiveness of the national education system is to increase the competitiveness of the country. In modern markets, educational services are delivered in a highly competitive environment (Kireeva et al., 2018).

Judson and Taylor (2014) have analyzed and shown the differences between using a marketing approach and marketization in higher education institutions. The authors make it clear that a marketing approach has a long term vision, and results, students acquire knowledge and skills, develop critical thinking, personal growth, beneficial not only for the student itself, parents or industry, but also for the whole society.

On the same note, there is the idea of considering students as customers, and academic programs as products intended for purchase. Mok (1999, in Brown, 2006: 58) refers to the "McDonaldization" of the superior education and shows that a university is an "atypical store":

- With a "Store" entrance that requires that the client passes a test (i.e. the universities where admission implies passing an exam);
- Which requires advance payment of substantial sums of money to take possession of the product;
- With customers that are encouraged to participate in creating the product for a considerable period of time;
- Where the supplier is free to refuse to offer the product to the customer if its standards are considered too low for the standards imposed by the university / "store".

Brown (2006) has identified many other reasons for considering universities as atypical organizations on the services market. First of all, considering education a commercial transaction, compromises the purpose of education and leads to a nar-

row definition of the notion of client. Students cannot be treated solely as clients as in a „pure” commercial transaction, they are, in the same time, resources made available by universities for the benefit of the entire society. Thus, confusion is created between short term satisfaction and long-term learning. Furthermore, the total dimension of the market and its distribution among universities is established by the governmental institutions which act as market organizers, universities having a limited autonomy in the decision-making process. Student satisfaction is determined to varying degrees, by public policy and university management. Moreover, the student - professor quality interaction is difficult to measure and the level of cognitive effort and the intensity of motivation required for consuming this service are very different compared to the ones associated to other services. In addition, products and services from the educational sector are „actively” consumed, the students becoming co-producers. If academic programs are the products and services sold by universities, there is a dilemma regarding up to which point students can be involved in defining their own curricula.

The emergence and development of the Internet has led to a major change in the nature of education (Wegerif, 2019), the nature of the student-professor relationship, but also in terms of providing support services. The use of the Internet forced university managers to innovate, rethink and redesign the academic programs, the curricula in order to adapt to the Z generation expectations. The members of this generation are tech-savvy, active on social networks and demand fast, even instant access to authentic information through new delivery modes and integrated online platforms.

Since Romanian universities, just like many universities from other countries, operate in a highly competitive environment, their corporate approach in management and market-oriented behaviours become more obvious. The survival and development of higher education institutions depend on creating and maintaining a long-term relationship with their stakeholders, mainly with their students. From durable relationships, universities might gain positive outcomes such as positive viral communication, the students need to identify with the image and reputation of the graduated university/faculty, commitment from alumni who become brand ambassadors for their universities.

Student perception is the starting point for evaluating the perceived quality of the educational services (Drule et al., 2014; Teng et al., 2013). According to Drule et al. (2014) the perceived quality of the educational process is one of the most important elements that favor the improvement and modernization of Higher Education.

The orientation towards entrepreneurship and the adoption of a marketing optic made concepts such as student satisfaction, perceived quality and perceived value count more. Knowing the elements of perceived value, the perceived benefits and sacrifices (what the student is willing to give for what the student receives) can lead to a better use of the human, financial, material resources, with long-term positive effects for the whole society.

Studies have primarily focused on the way the perceived value of HE is formed and its impact on the satisfaction and loyalty of university stakeholders. Research has shown more interest on the perceived value of university programs, the technical value ("what is offered") and less on the perceived relational value ("how it is offered"), the social value, the perceived value of servicescape, more on the hardware quality and less on the humanware quality. In this study, we highlighted that the other dimensions of perceived value (relational, social, servicescape) have an influence on how students perceive the technical value or what the faculty programs offer them and that its development requires the development of other dimensions of perceived value.

In Central and South-Eastern European countries there is a limited number of studies that tackle the students' perception regarding the value of HEI and its determinants. The main reason could be the time lag between the entrepreneurial perspective adoption and the marketing function integration in these universities compared to the universities in the developed countries of Western Europe, America, Asia, etc.

The present study tried to cover this gap by decomposing the value offered by HEI in Romania into 5 dimensions and testing the relationships between the identified dimensions. In addition, the study determined the influence of some factors (image, relationship duration, source of financing the studies) on the perceived value of the university offer.

Our findings indicate that students judge the technical value ("what is being offered?") both directly and under the influence of the relational or functional value ("how is it offered?"), the social value and the service' environment value. We determined that the HEI's image influences the students' perception on the university's offer, which proves that adopting the marketing optic is very important. The perceived value has a dynamic character, it changes as the students get to know the university' offer better. However, the source for financing the studies (own funds or from the budget) does not have a significant influence on the perceived value of the HEI.

2. LITERATURE REVIEW

2.1. The perceived value of the higher education

The title of this paper has been suggested by Woodall's article (2003: 21) which associates the perceived value with the popular Rubik cube. The metaphor suggests the idea that in order to satisfy their customers, companies have to break down the value they expect in several dimensions and find the best combination.

For Monroe (1990, in Sánchez-Fernández, Iniesta-Bonillo, 2007: 440), the buyer's perceptions of value represents a balance between the perceived quality or benefits associated with the product, and the perceived sacrifices made for paying the price for that product.

Using the theory of consumption values, Sweeney and Soutar (2001) developed the PERVAL model and identified four dimensions of value: (1) emotional; (2) social; (3) quality / performance and (4) price/value for money. Wang, et al. (2004) adopted the framework proposed by Sweeney and Soutar and included other non-monetary sacrifices such as time, effort and energy in their model.

Heinonen (2004) identifies four dimensions of the perceived value of services: (1) the technical value refers to the attributes of the basic service offered by the company (tangible elements of the service, the supplier's image, the purchase price); (2) functional value refers to the attributes of the serving process or to the seller-buyer interaction (promptness of services, quality of interaction, quality of communication, kindness, empathy, personalization, relational sacrifice, etc.); (3) time value refers to attributes related to the moment of service (delivery speed, waiting time, accessibility, etc.); (4) environment value includes attributes that relate to the place or environment of service delivery (ambience, visibility, agglomeration).

Authors who have approached the perceived value of educational products and services report the small number of articles published on this topic (Alves, 2010; Brown, 2006). In the context of the higher education sector, the perceived value is the result of a complex process where benefits can be assessed in academic, social, personal and employability terms, while sacrifices are either of a monetary nature (registration taxes, studio fees, travel, accommodation, etc.) or consider personal effort.

Takalo, et al. (2013) emphasizes that the product of education is intangible and therefore it can be difficult to quantify. The authors point out that marketization is an erroneous orientation because it focuses on the satisfaction of stakeholders (students, faculty, future employers, government, etc.) to the detriment of the academic goal of current learning and long-term orientation, which ensures the viability of universities.

Doña-Toledo et al. (2017: 538) define value as "the net result of assessing perceived sacrifices and benefits, taking into account academic, social, quality aspects, personal development issues, employability and confirmation of expectations as the final results." Literature review has highlighted the use of several established scales to measure the perceived quality of the services provided by universities: SERVQUAL, GLOVAL, SERVPERF, PERVAL, SERV-PERVAL.

Cronin and Taylor (1992) have developed the SERVPERF scale (service performance measurement scale) that has been successfully used in assessing the perception of quality for the service offered by universities in UK. The main instrument used to measure the perceived value of educational products and services is the PERVAL scale developed by Sweeney and Soutar (2001).

HEdPERF is a specific scale for measuring the perceived quality of services for higher education institutions and includes 41 items (Firdaus, 2006, a). Firdaus (2006, b) made a comparison between the HEdPERF scale and the SERVPERF scale

in terms of reliability, validity and unidimensionality. By combining two factors specific to the SERVPERF scale (reliability and empathy) and two factors specific to the HEdPERF scale (non-academic aspects and academic aspects) the HEdPERF-SERVPERF scale resulted.

Alves (2010) made a research addressing the perceived value of products and services offered by higher education and identified the studies below.

Table 1.: Studies on the perceived value of educational products and services

Authors and year	Type of approach
LeBlanc and Nguyen (1999)	Multidimensional approach where the perceived value had the following dimensions: • Functional value expressed by the quality / price ratio; • Epistemic value; • The functional value expressed by the possibility to achieve the goals after graduation; • Emotional value; • Social value.
Brown and Mazzarol (2009)	Multidimensional approach in which perceived value was measured through: • Emotional value; • Social value; • Price / value; • Performance.
Sanchez-Fernandez, et al. (2010)	The authors consider the quality of interaction, trust and image as antecedents of perceived value, while satisfaction and loyalty are the consequences of perceived value.
Jiménez -Castillo, Sánchez -Fernández and Iniesta- Bonillo (2013)	Perceived value is measured by: • Economic value of the facilities and services (efficiency); • Perceived value of academic programs (excellence); • Social value (status and esteem); • Hedonic value (ludic and aesthetic aspects); • Altruistic value (ethics and spirituality).
Doña-Toledo, Luque- Martínez and Salvador Barrio-García (2017)	Authors validated a model of the antecedents and consequences of university graduates' perceived quality and analysed the moderating role of the level of involvement in higher education variable. Perceived quality is the main antecedent of perceived value comprising four dimensions: teaching staff, infrastructure, administrative staff, and support services. Overall satisfaction and overall image of the university are considered consequences.

Source: Alves, 2010, p. 17; authors.

In their study, Sanchez-Fernandez, et al. (2010) present the antecedents and consequences of the perceived value of educational services. The authors consider the quality of interaction, trust and image as antecedents of perceived value, while satisfaction and loyalty are the consequences of perceived value.

Identifying the components of perceived quality is a complex task due to the variety of programs and services offered by universities (Bigné et al., 2003).

Pereda et al. (2007) identify four dimensions of the perceived quality of educational services: (1) recognition / image / reputation; (2) the quality of academic training and the interaction with the educational service provider staff; (3) sufficiency of resources; (4) the quality of the facilities.

Doña-Toledo et. al. (2017) included the following components of perceived quality: (1) the perceived quality of the services provided by the academic staff; (2) the perceived quality of the university infrastructure; (3) the perceived quality of the services provided by the administrative staff; (4) the perceived quality of support services.

Teeroovengadam, et al. (2016), claiming the superiority of their HESQUAL model in comparison with other models, decompose the perceived quality into the following dimensions: (1) the perceived quality of administrative services; (2) the perceived quality of the physical environment; (3) the quality of educational services or study programs; (4) the perceived quality of the support facilities; (4) the transformative quality.

LeBlanc and Nguyen (1999) developed a model for perceived value and identified six dimensions of the perceived value of higher education: (1) functional value (economic utility or employment opportunities offered; (2) epistemic value (knowledge); (3) the image; (4) the emotional value; (5) the functional value (quality / price ratio or the perception that the investment in education is worth it); (6) social value;

Jiménez -Castillo et. al. (2013) identified five dimensions of the perceived value of the educational offer: (1) the economic value of the facilities and services offered by the university (efficiency); (1) the perceived value of the academic programs (excellence); (3) the social value (status and esteem); (4) the hedonic value (ludic and aesthetic aspects); (5) the altruistic value (ethics and spirituality).

Literature approaches social value primarily through its ability to help consumers increase their perceived status in the community and/or improve their self-esteem (Kumar, Noble, 2016). Thus, students become aware of their status and increase their self-esteem by following the courses of a faculty that has a favorable image, establishing a congruence between the image of the institution in which they are enrolled and their own image. Moreover, the social value is about the benefits derived from the interpersonal / group relations and mentioned in the context of friendship with other students and social interactions (Lai, et al., 2012; Sığircı, Gürdal, 2012).

Alves (2010) considers that the students' perception of value is determined by the general image of the institution and its perceived quality, and that the perceived value is decisive for students' satisfaction and loyalty. Starting from the characteristics of the services provided by higher education institutions, especially the high level of involvement and their importance in the current and future life of the students, the author took into consideration the following variables: i) students' future objectives; ii) the ratio between prices and quality; iii) comparison with alternatives to meet the student's need; iv) emotions.

Ng and Forbes (2009) show that the basic service provided by a university is the learning experience, which can be a transformative experience as the value of learning is created by education providers together with students. Students have two essential roles in creating the service output: they are productive resources, and they contribute to quality, satisfaction and value (Ng, Forbes, 2009). As a productive resource, a "richer resource" student, is a student that requires less effort to supervise, has greater independence and is more reliable. As a contributor to quality, satisfaction and value, the student can choose the level of effort he or she makes to learn.

Ng and Forbes (2009), highlight two important ideas for studying the perceived value of educational services. The first idea is that the learning experience is emerging, unstructured and uncertain, and the second idea is that the learning experience, like the experience of other services, includes hedonic, aesthetic and emotional dimensions. Student life is about the physical, psycho-social activities, the formation of values, taste, ideologies. This idea points to another important idea: the university can create the environment ("servicescape") that will lead to the increase of the perceived value of the educational services. The environment or servicescape refers to the physical facilities in which the basic service is delivered, which enables the socialization process. The creation of a highly perceived value of the basic service experience is possible by providing additional services: application and registration processes, tax payment procedures, university accommodation facilities, and accommodation conditions. These additional services are called "hygiene services" (Loveloch, Wirtz, 2003, in Ng, Forbes, 2009, p. 11) because they satisfy the basic needs of students. According to the above-mentioned authors, offering them does not increase satisfaction, but it prevents dissatisfaction.

2.2. Hypotheses development

From a marketing perspective, the influence of corporate image is recognized, although there is not much empirical evidence to support it (Sánchez-Fernández, et al., 2010).

The university image is a set of adjectival interpretations that subjects associate spontaneously with that university and to the various attributes of its offer (Doña-Toledo et al., 2017).

A higher education institution does not have an absolute image, this being influenced by the image of the other universities in a country. We appreciate that the image of a university is also influenced by the image of the country brand. The various categories of public elaborate judgments on the general image of a university based on the impressions, the stereotypes that they form regarding the strengths and vulnerabilities of the offer of that university. These images are formed under the influence of viral communication, the experiences of the target audience with the offer of the university and its marketing activities.

The relationship between the image of the university and the perceived value has not been given much attention in the marketing literature. However, in other areas, the organizational image is considered either an antecedent or a mediator of several constructs: perceived value, perceived quality, individual loyalty, or loyalty and satisfaction taken together (Sánchez-Fernández, et al., 2010).

In marketing literature several perspectives can be identified about the relationship between the image of a higher education institution and the perceived value of its offer.

Thus, several studies consider the image to be an antecedent of perceived value (Alves, 2011; Brown, Mazzarol, 2009; Sanchez-Fernandez et al., 2010). Other studies consider the image to be a consequence of value perception (Doña-Toledo et al., 2017; Duarte et al., 2012; Ivy, 2001). Various researches have concluded that the image is a component of the perceived value (Ledden et al., 2011), considering that there is a congruence between the image of the individuals attending the university and the institutional image of the respective institution (Sanchez-Fernández, Iniesta-Bonillo, 2007). In this article we adopted the perspective of the institutional image as an antecedent of the perceived value and consequently we formulated the hypothesis H_1 .

H₁: The faculty's image has a direct, positive and statistically significant influence on the perceived value of its offer.

Ravald and Grönroos (1996) explored the concept of value from the perspective of relationship marketing and show that the perceived value includes the perception of the value of the relationships and commitments that are formed between customers and service providers.

Gwinner et al., (1998) identifies the following categories of relational benefits: (1) social benefits; (2) psychological benefits; (3) economic benefits; (4) customization benefits.

In the context of programs and services offered by universities, the duration of the student's relationship with the faculty influences the perceived value of the programs and services offered. This happens because of the increased trust between partners, the emotional investment made by the student, the increased identification with the faculty, the increased congruence between the goals pursued (offering and acquiring competences that will lead to a higher degree of employability). Also, the universities offer a unique social life, internships, the possibility of establishing relationships with the business environment during the studies, and the relations with the administrative staff become friendlier as a result of the learning process that the partners go through.

Sığircı and Gürdal (2012) addressed the perceived value of marketing education from different perspectives. In our opinion, their findings can be extrapolated to higher education in general.

The cycle of education, the bachelor or master program, has a significant influence on the perception of the epistemic/academic value, emotional/internal value, image of marketing education, social value, image of marketing education institution, and monetary sacrifices. There is a difference in the perception of value between the alumni and the students that are still enrolled in university cycles. According to the level of their marketing education, the perception differs significantly especially based on these factors: functional/career value, non-monetary sacrifices, emotional/internal value, and social value (Sığircı and Gürdal, 2012). The authors show that there is a significant difference between the ones who have a marketing education for less than 6 months and more than 2 years based on social value perception. The latter perceive the education's social value higher than the first group.

The authors consider that the differences between the groups included in their study are given by "myopia", the bachelor students do not take into account the realities and do not have clear expectations regarding the labor market, although they take into account the different dimensions of the perceived value as well.

Lai et al. (2012) have conducted a research to see the effects of other demographic and social variables on students' value perceptions and overall satisfaction. However, no significant differences between the mean scores of the subgroups on each of demographic and social variable were found. Still, they show students become critical as they progress from the first year to the second, except for the functional value. In the fourth year, they report more positive affective responses towards what they receive and reveal higher satisfaction, except for social value and emotional value (Lai et al., 2012).

Starting from the above, we formulated hypothesis H_2 .

H_2 : The duration of the relationship with the faculty (the student's cycle) has a direct, positive and statistically significant influence on the perceived value of the offer.

Customers are often unable to assess the technical quality of services even after they have been purchased due to their lack of knowledge and experience (Babic-Hodovic et al., 2017; Gronroos, 1984;). Consequently, functional quality often compensates for the inability to assess technical quality, consumers often overvaluing this dimension (Babic-Hodovic et al., 2017; Gronroos, 1990). Ravald and Grönroos (1996) show that the value of relationships influences the perceived value of the basic service.

Based on these results, we formulated the H_3 hypothesis.

H_3 : Relational value or functional value influences directly and positively the perception of the technical value of the offer.

The cognitive perspective on perceived value has evolved towards a more holistic and experiential perspective that recognizes value in the context of customer experience as part of extended social systems (Grönroos, Voima, 2013). Understanding

the process of perceived value formation can also be facilitated by taking into account Helson's adaptation level theory (1964, in Kontek, 2010: 1). Helson emphasizes the importance of context effects in influencing perception. According to the author, the answer to a focal stimulus cannot be understood without considering the context and the residual stimuli. The "residual" stimulus refers to the experiences that individuals had in the past with the same stimuli and the formation of references. The actual focal point is judged, according to the author, in relation to the level of adaptation that is an average value of all contextual stimuli and residuals.

In their study on the perceived value of mobile services (m-service), Gummerus and Pihlstrom (2011) show that context affects the value perceived by customers, in this case students, because the assessment is based on the interaction between context, object and customers / students. The authors include among the contextual factors physical context and time context. Physical context refers to tangible conditions such as light, noise, temperature, agglomeration. The time context refers to the flexibility of carrying out some activities, but also to the easy access of the students, regardless of time and space, to information about the schedule, the scheduling of exams, the course support, the dean's program, the program of secretariats, etc. In this research we start from the hypothesis that the environment of the service and the social environment offered by the faculty are contextual stimuli from Helson's theory and influence the perception of the technical value of the faculty offer.

H₄: The value of the servicescape influences directly and positively the perception of the technical value of the offer.

H₅: The perceived social value influences directly and positively the perceived technical value.

Starting from the perceived value definitions, organizations can increase the perceived value either by offering extra benefits to customers or by reducing sacrifices. Research has shown that in the context of higher education, sacrifices are either of a monetary nature (registration taxes, tuition fees, travel expenses, accommodation, etc.) or take into account the personal effort of the students. It can be deduced that the student's status, with or without a tax (monetary sacrifice), influences the perception of the value of higher education. Kahneman and Tversky (1979) in Perspective theory, formulated the idea that gains, and losses are perceived in monetary units.

Thus, fee-paying students, who accept higher monetary sacrifice than students who do not pay study fees, perceive differently both the perceived global value and the dimensions of perceived value: social value and temporal value.

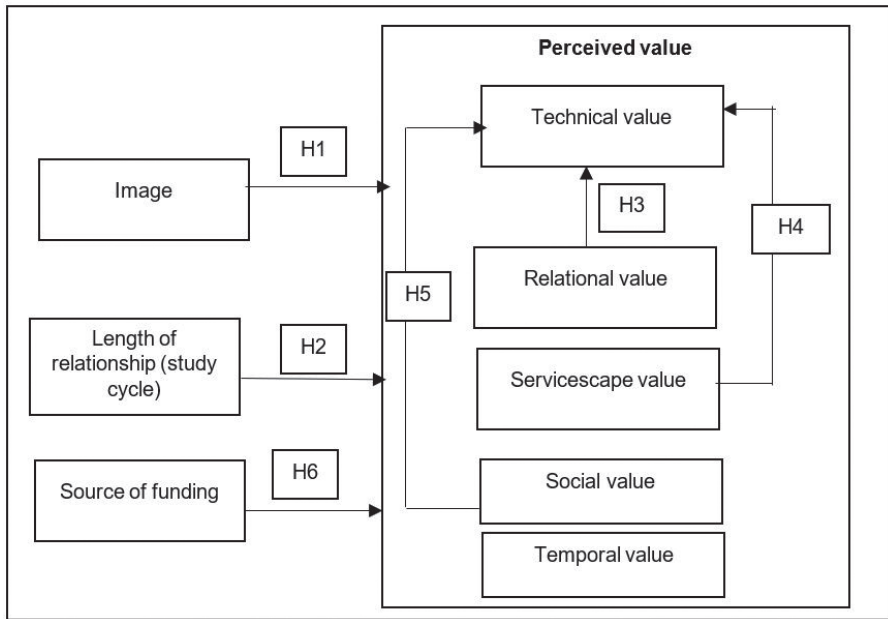
Lai et al. (2012) found that the total cost of education (fees and other expenses) influences the value perceived as a whole, but also its dimensions: functional value / academic value, perception of non-monetary sacrifices, emotional value, social value and perception of monetary sacrifices.

Starting from the above, we formulated the hypothesis H_6 .

H_6 : *There is a significant statistical link between the perceived value of the offer and the way it is financed.*

The proposed research model is presented in Figure 1.

Figure 1.: The proposed research model



Source: Authors' own research.

3. METHODOLOGY

In this study, we aim to analyse the perception of the value of products and services offered by the largest faculty from the West University of Timișoara, Romania. In our study we used Brown's model (2006), Leblanc and Nguyen's scale (1999), and Alves' scale (2011). We also considered the influence of image on the perceived value of educational products / services, adopting the approaches proposed by Jiménez-Castillo et al. (2013), Brown and Mazzarol (2009), Brown (2006).

We used a five points Likert scale to measure the perceived value and the five points Osgood scale with bipolar statements to measure the faculty' image. Starting from the literature review, from the models and approaches mentioned above, we decomposed the perceived value of the university' offer in five dimensions: the technical value, the relational or functional value, the value of service environment, the

temporal value (economy, flexibility), and social value.

To measure the perceived value of educational products, we structured the total sample of 320 respondents into two sub-samples: a sample of students from the undergraduate cycle and a sample of students from the master's cycle. We found it useful to carry out the empirical research on two sub-samples because the length of customer-product relationship is different. In this way, we can get interesting conclusions about the evolution of perception over time. We also considered the influence of the method of financing the studies on the perceived value components because, as research has shown, the monetary sacrifice (cost fees, accommodation) is an important component of perceived value (Ledden et al., 2007).

The structure of the sample used in this research is presented in Table 2., in which we can observe the relative frequencies valid for the main profile variables.

Table 2.: Structure of the sample

Profile variables	Categories of profile variables	Valid relative frequencies
Study cycle	Bachelor	45.0%
	Master	55.0%
Source of funding	Unbudgeted	61.8%
	Budgeted	38.2%
	Personal wage	27.6%
Source of income	Family income	69.9%
	Scholarships from foundations	0.3%
	Other sources	1.3%
	Own business	0.6%
	Pension	0.3%

Source: Authors' own research.

4. RESULTS AND DISCUSSION

4.1. The properties of the scales

In order to carry out the statistical analysis of the data, the following steps were followed: (1) analyzing the reliability of the measurement scales used, (2) verifying the opportunity to perform the factorial analysis, (3) conducting the exploratory and confirmatory factor analysis and (4) testing the research hypotheses.

The reliability analysis of the measurement scales was performed using the Cronbach coefficient α . According to George and Mallery (2003), a measurement scale is reliable if the Cronbach α coefficient value is greater than 0.5. Also, the Cronbach coefficient of the measurement scale was determined if each item was deleted. If this coefficient determined by eliminating an item from the scale had a value

greater than the value of the Cronbach coefficient determined for the whole scale, the item was removed from further statistical analysis (because it reduces the overall reliability of the measurement scale).

The opportunity to perform the factorial analysis was verified using the Bartlett sphericity test and the Kaiser-Meyer-Olkin indicator (KMO). Factor analysis can be performed if the KMO indicator value is greater than 0.5 and the significance level of the Bartlett sphericity test is less than 0.05.

Factorial analysis for each dimension / construct was performed using principal component analysis. This method was used to decompose the entire variance of the variables.

The decision to keep the factors in the analysis was made based on the Kaiser criterion (eigenvalue > 1) and Cattell's turning point method (1966). Cattell's turning point method was used because sometimes the Kaiser criterion tends to overestimate the number of factors. Factor loadings were determined for each item within the factor analysis. Thus, only items that recorded factor loadings greater than 0.4 were retained in the subsequent statistical analysis (Field, 2009).

To test the research hypotheses, we used simple linear regression (in the case of the research hypotheses H_1 , H_3 , H_4 and H_5) and the t-test for independent samples (in the case of the research hypotheses H_2 , H_6). Statistical analysis of the data was performed using the software package SPSS (Statistical Package for the Social Sciences), version 23.

Table 3. presents the values of α Cronbach coefficients, the values of the KMO indicator (Kaiser-Meyer-Olkin) and the significance level of the Bartlett sphericity test for each dimension / construct within the research model.

Table 3.: Scale properties and opportunities of achieving the factor analysis

Dimensions/Constructs	Initial C.A.	Intermediary C.A.	Final C.A.	KMO	Significance of Bartlett's test (p)
VT	0.903	-	0.908	0.931	0.000
VF	0.791	0.855	0.859	0.861	0.000
VSp	0.572	-	-	0.646	0.000
VTm	0.722	-	-	0.686	0.000
VS	0.814	-	-	0.810	0.000
VP	0.860	-	-	0.839	0.000
Im_Fac	0.806	-	0.822	0.853	0.000

Notes: C.A. - Cronbach's α ; KMO - Kaiser-Meyer-Olkin; abbreviations used: VT - Technical value, VF - Functional Value, VSp - Servicescape value, VTm - Temporal Value, VS - Social value, VP - Perceived value, Im_Fac - Faculty Image.

Source: Authors' own research.

The reliability of the measurement scales used was measured using the α Cronbach coefficient. Table 3 shows that all measurement scales are reliable. The Cronbach coefficient values are greater than 0.5 (George and Mallery, 2003). Consequently, all the dimensions and constructs analyzed were retained in the following statistical analysis.

For all dimensions and constructs remaining in the analysis after the reliability step of the scales, the significance level of the Bartlett sphericity test is equal to 0.000 (<0.050). Also, the KMO indicator values are higher than 0.500. In these conditions, we can say that factorial analysis can be performed, because there are statistically significant correlations between the items of each dimension / each construct and these correlations are strong enough.

Using the Kaiser criterion ($\text{eigenvalue} > 1$) and Cattell's turning point method, only one factor was extracted for the following dimensions: functional value, social value, temporal value and technical value. Only one factor was extracted in the case of the "Perceived Value" and "Faculty Image" constructs.

The extracted factor explains: 45.16% of the total variation in the case of the "Technical value" dimension, 44.77% of the entire variation in the case of the "Functional value" dimension, 54.61% of the entire variation in the case of the "Temporal value" dimension, 53 % of the total variation in the case of the "Social value" dimension, 37.05% of the total variation in the case of the "Faculty image" construct and 65% of the entire variation in the case of the "Perceived value" construct. In the case of the "Servicescape value" dimension, two factors were extracted. The first factor refers to the educational spaces of the faculty and includes the items VSp_1 ("The spaces of the faculty are comfortable"), VSp_4 ("The spaces of the faculty are well marked") and VSp_5 ("The faculty has modern technologies (computer network, computer system, student management, presentation of results)"). The second factor relates to teaching and includes items VSp_2 ("All educational activities are conducted in the same building") and VSp_3 ("The effort to get from one course to another is great"). The two extracted factors explain 62.60% of the entire variation in the case of the "servicescape value" dimension. All items belonging to the "Functional value", "Servicescape value", "Temporal value" and "Social value" dimensions, and to the "Perceived value" and "Faculty image" constructs have values of factor loadings greater than 0.4 (Field, 2009). Taking into account these results, we can keep all the items in the analysis, because they are strongly correlated with the factor extracted in the case of each dimension / each construct. Item VT_17 ("The exam results and other information that build my image are confidential") within the measurement scale of the dimension "Technical value" registered a factor load value equal to 0.394 (<0.4). This item was removed from subsequent statistical analysis.

4.2. Hypotheses testing

The research hypotheses were tested using simple linear regression and the t-test for independent samples. The following indicators are presented in Table 4.: the value of the unstandardized regression coefficient (B), the calculated value of t (t-value) and the level of significance (p).

Table 4.: Testing the research hypotheses

Research hypotheses	B	T	P	Result
H ₁ : The faculty's image has a direct, positive and statistically significant influence on the perceived value of its offer.	0.584	17.563	0.000	Accepted
H ₂ : The perceived value of the offer differs significantly depending on the duration of their relationship with the faculty.	-	4.060	0.000	Accepted
H ₃ : The perceived functional value has a direct, positive and significant influence on the perceived technical value of the offer.	0.742	18.364	0.000	Accepted
H ₄ : The perceived value of the servicescape has a direct, positive and significant influence on the perceived technical value of the faculty offer.	0.383	7.044	0.000	Accepted
H ₅ : The perceived social value has a direct, positive and significant influence on the perceived technical value.	0.708	19.721	0.000	Accepted
H ₆ : The perceived value of the offer differs significantly depending on the way studies were financed.	-	-0.208	0.836	Rejected

Source: Authors' own research.

Analyzing the values in Table 4. we can see that the faculty image has a direct, positive and significant influence on the perceived value of its offer ($B = 0.584$; $t = 17.563$; $p = 0.000 < 0.050$), the H₁ research hypothesis being accepted. The faculty image explains 49.2% of the variation of the perceived value of the offer ($R^2 = 0.492$). The results obtained are similar to those obtained by other authors in their studies (Brown, Mazzarol, 2009; Sanchez-Fernandez et al., 2010; Alves, 2011).

The H₂ research hypothesis is supported ($t = 4.060$, $p = 0.000 < 0.050$). The perceived value of the faculty offer differs significantly depending on the cycle in which the students are enrolled or the duration of the relationship with the faculty. Students who attend the bachelor's degree courses (the average is 0.6113) perceive a higher value of the faculty offer compared to the students who attend the master's degree courses (the average is 0.3791).

The result is different from that obtained in other studies which show that a longer duration of the relationship can lead to the perception of a higher value of the educational offer, at least for certain dimensions of value (Lai, et al., 2012; Siğircı, Gürdal, 2012). In our opinion, it can be either the level of the expectations of the undergraduate and master's students, or the reduced maturity of the labor market that

does not yet make great differences between the graduates of the two cycles in terms of the employment opportunities offered.

After testing the H_4 research hypothesis within the proposed conceptual model, we can observe that the value of the unstandardized coefficient of the regression function is 0.383, the calculated value of t equals 7.044, at a significance level of 0.000 (<0.050). In view of these results, we can conclude that the perception regarding the value of the service environment (the servicescape value) has a direct, positive and significant influence on the perceived technical value (the H_4 research hypothesis is supported).

The H_3 and H_5 research hypotheses are accepted. The perceived functional value ($B = 0.742$; $t = 18.364$; $p = 0.000 < 0.050$) and the perceived social value ($B = 0.708$; $t = 19.721$; $p = 0.000 < 0.050$) have a direct, positive and significant influence on the perceived technical value of offer.

The hypothesis that functional or relational perceived value influences technical value is confirmed in other authors' studies (Babic-Hodovic et al., 2017; Ravald, Grönroos, 1996).

The R value equals 0.717 (the case of the H_3 research hypothesis) and 0.742 (the case of the H_5 research hypothesis). Taking these results into account, we can say that the relationship between the perceived social value and the perceived technical value is stronger than the relationship between the perceived functional value and the same perceived technical value.

The H_6 research hypothesis is rejected. The perceived value of the faculty offer ($p = 0.836 > 0.050$) does not differ significantly from a statistical point of view depending on the way studies are financed (budgeted or non-budgeted). The result is different from that obtained by other authors (Lai et al., 2012) who show that the perception of the sacrifices associated with the educational offer (the cost dimension) influences the perceived value of higher education. The result is surprising from the Value Theory's point of view, according to which, the perception of higher costs, means a greater "pain" in the perceived value balance, which leads to a reduction in the net perceived value of the educational offer.

5. CONCLUSIONS

The downsize in student numbers and the intensification of competition, starting from the globalization of the educational offer, led to the awareness of the importance of the various dimensions of the modern holistic marketing: relational marketing (stakeholders, partners, network marketing), integrated marketing (integrating the marketing mix variables), internal marketing (own staff as a stakeholder and the relationship between departments), societal marketing (ethics, community, natural environment).

Starting from the peculiarities of the educational offer, managers should adopt a societal marketing orientation, which implies that, in addition to the needs of universities, faculties, they should consider stakeholder expectations, and those of society as a whole.

Knowing how the perceived value of the higher education institutions offer is formed as well as its influencing factors, is a constant concern for the marketing literature and universities in developed countries, but it is less present in the marketing literature and universities from emerging countries.

Following the quantitative research, carried out on a sample of 320 students from the bachelor's and master's degree, we found that the perceived value of the educational offer is made up of several dimensions that influence each other.

Thus, the perceived relational value (the quality of the support departments services, the quality of information, the quality of the interaction with the administrative and the teaching staff) affects the students perception of the quality of learning, the usefulness and the quality of the acquired knowledge, the employment opportunities after graduation, but also the appreciation of the ratio between what they give and what they receive. Also, the perceived value of the servicescape, the ambience in which education is offered, influences the judgments students make regarding the technical value of the educational offer. The social value, given either by the self-identity that the students create by graduating the courses of a higher education institution, or by the interaction and social life specific to the student life has influences on the (basic) technical value of the offer.

Our research also reveals that the institutional image positively influences the perceived value of the educational offer, the more favourable the image, the higher the perceived value. Contrary to other studies, we did not identify a significant statistical relationship between the way of financing the studies or the monetary sacrifice (financing from own income / family or from the budget) and the overall perceived value, respectively the social value and the temporal value of the educational offer.

Most universities have institutional marketing support departments that run integrated marketing communications campaigns, to differentiate and position themselves, to improve their image and perceived value. Offline and online integrated marketing communications campaigns target various university stakeholders: bachelor/ master/ doctorate candidates, highschool graduates, alumni, companies, foreign students, foreign partners, own staff.

Universities have to stay in touch with their graduates as a means to improve their image and perceived value as graduates continue to evaluate their university experience even after getting their diploma (Dona-Toleda et al., 2017). This relationship requires the frequent communication of interest (such as graduate opinion polls, university management indicators, or reports on the institution's corporate social responsibility) and the development of appropriate support structures such as

graduate clubs and associations, and online social networks to encourage the interaction between university and graduates.

According to Wilkins et al. (2015) the student's identification with the HE institution means greater levels of satisfaction, involvement and loyalty. Such identification brings with it greater involvement and commitment among students.

Specifically, identification leads students to involve themselves directly and organizationally with the university, and even to commit themselves to remaining loyal to the institution and thus make alumni donations in future (Freeland et al. 2015). Thus, universities should engage students in their activities and processes, to achieve better results in terms of perceived quality, perceived value and satisfaction, to project their future image. Some universities have branding strategies and tactics that aim to create the identity of their brand and increase their students', graduates', employees' need to identify with the university brand.

Increased interaction with students and alumni through digital and social platforms contributes the perceived relational value development. A large number of followers and likes for institutional accounts on Social Media has a positive impact on brand performance and student recruitment, especially when universities use social media to create engagement and answer quickly and helpfully to questions potential students might ask (Rutter et al., 2016).

Organizing marketing campaigns through events, where writers, diplomats, reputable researchers are invited, help develop the relational value and the perceived social value.

To improve their image and increase their perceived technical ("what is offered"), temporal and social value, it is also helpful for universities to use mass media and social media advertising campaigns, public relations campaigns that communicate the position occupied in international rankings or the acquisition of modern equipment.

In future research we aim to approach the formation of perceived value and its influencing factors by making comparisons between graduates of higher education institutions and their students. We also intend to consider other categories of stakeholders, teaching staff, managers, partners, the local community, but also to expand our research on the stakeholders of several universities. In future studies we intend to investigate, in addition to the antecedents of perceived value, its consequences on the satisfaction and loyalty of the university's stakeholders. Finally, we intend to identify stakeholder perceptions and attitudes towards issues such as social responsibility and societal marketing, sustainable development of universities by considering the variables of social, cultural, natural inclination towards environmental protection etc.

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Appendix 1. The faculty' image scale (adapted from Jiménez -Castillo et al., 2013; Brown and Mazzarol, 2009; Brown, 2006).

(5-Point Semantic Differential Scale)

Items	1	2	3	4	5	
The faculty has a traditional approach						The faculty has a modern approach
The faculty has a bad reputation						The faculty has a good reputation
The faculty is not considered prestigious among other faculties of same profile						The faculty is considered prestigious among other faculties of same profile
The faculty offers an unfriendly environment						The faculty offers a friendly environment
Educational programs are oriented towards professional practice						Educational programs are research oriented
Study programs have a local approach						Study programs have an international orientation
Professors and their needs are at the centre of curriculum planning						Students and their needs are at the centre of curriculum planning
The teaching staff is not well prepared						The teaching staff is well prepared
The courses are mostly theoretical						The courses are mainly practical
The practical applications from the seminar are not relevant to the business practice						The practical applications from the seminar are relevant to the business practice
The probability of finding a job after graduation is reduced						The probability of finding a job after graduation is high

Appendix 2.: The perceived value scale (adapted from Alves, 2011; Leblanc and Nguyen, 1999)

The perceived technical value scale („what is offered?“) (5 - Point Likert Scale) Items The courses at this faculty are well structured The courses are well presented The courses are of long-term relevance The courses offered by the faculty are complex The fees required to complete a program are low I appreciate that the program followed is worth the investment The information provided at courses and seminars is constantly updated The costs of the program and the services offered are known from the beginning The information I get from the faculty courses stimulates my curiosity The faculty offers me the possibility to choose from a wide range of choices The faculty offers me the opportunity to choose a specialization suitable for my skills After classes I ask myself questions about what I found out The tasks to be performed for assessments / tests-exams are clear The knowledge offered by courses and seminars is practical I am confident that graduating this college will give me the opportunity to pursue a career The results and other information that build my image are confidential I am confident that I will receive what I expect from attending college	The functional or relational value scale („how is it offered?“) (5 -Point Likert Scale) Items The teaching staff has a professional behavior Interactivity is encouraged in this college The support staff service is well set up I am offered the possibility to obtain individual professional counseling from the teaching staff Teaching staff behavior is distant The services provided by the faculty staff are prompt I appreciate the friendliness of the college staff Relations with faculty staff are comfortable The faculty staff strives to understand my needs The faculty website is constantly updated The necessary information is provided promptly The administrative information provided (schedule, fees, curricula, costs) is perishable In the selection of the specialization I need help from others In the selection of optional courses I need help from others
The perceived service environment or servicescape scale (5 -Point Likert Scale) Items The faculty spaces are comfortable All teaching activities take place in the same building The effort required to get from one course to another is great Faculty spaces are well signposted The faculty uses modern technologies (computer network, student management system, presentation of results)	The perceived temporal value scale (5- Point Likert Scale) Items This college gives me the opportunity to use my time efficiently The curriculum is flexible The waiting time for solving administrative problems is reduced The waiting time for receiving evaluations is acceptable

The perceived social value scale (5 - Point Likert Scale)

Items

- In my circle of friends, I am proud of the choice I made
- I am confident that the faculty will help me gain a good social position
- Student life is a positive experience
- I like the social life of the faculty
- The faculty puts us in touch with the business environment
- I opted for this college because its profile is requested on the market

IMPACT OF TECHNOLOGICAL INNOVATION, RESEARCH AND DEVELOPMENT ON THE DEFENSE ECONOMY – IRAN COUNTRY

**Bahman Khanalizadeh, Dr. Neda Ranjandish,
Bahman Khanalizadeh**

(1, 2) Department Economics, College of Economics and Accounting,
Islamic Azad University, South Tehran Branch, Tehran, Iran

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Defense Economics; Research and Development; Technological Innovation;
Economic Growth; Iran

ABSTRACT

The Purpose. *This research is to investigate the relationship between the variables of technological innovation, research and development costs, economic growth, sales and export of weapons and military costs in Iran for the years 2000 to 2017.*

Design/Methodology/Approach. *In this study, we examine using Autoregressive Distributed Lag (ARDL) method to explore the estimating the impacts of technological innovation, research and development costs, economic growth, sales and export on military costs.*

Findings/Implications. *The results of this study showed that the impact of technological innovation and research and development costs on military costs is negative in short-term and long-term. Although the effect that these two variables have on military spending in the short-term is very close, in long-term the effect that research and development costs have on military spending is far greater and more significant. Also, the impact of economic growth on Iran's defense economy is much less than the variables of technological innovation and research and development costs. So that this effect will be less in long-term. But, the amount of arms sales and exports in the short-term has a positive effect on defense spending, but in long-term it becomes negative and increase in arms sales and exports can help Iran's defense economy.*

Originality. *The countries defense economy can always have positive effects on military and civilian research and development, scientific innovation and technological progress, in this condition that the country's macroeconomics can spend military spending on research and development and support innovation and inventions. Eventually adopt arrangements that use the innovations of the defense industry in the civilian sector, which will lead to economic growth. This is the experience of many developed countries that have been able to use the technological advances and innovations of the military sector in the civilian sectors as well, and to cause the economic progress and development of their country.*

1. INTRODUCTION

Economics and its relationship to militarism, called defense economics, is a very important and complex issue that can be considered from different angles. The economy can both grow and be damaged by military activity.

Some countries have been able to gain significant foreign exchange through the production and sale of weapons. But in least developed countries (LDCs) and developing countries, the situation is very different. So that in the mentioned countries, the military expenses that are usually spent to provide security, analyze the economic power of the countries and affect their livelihood and development process.

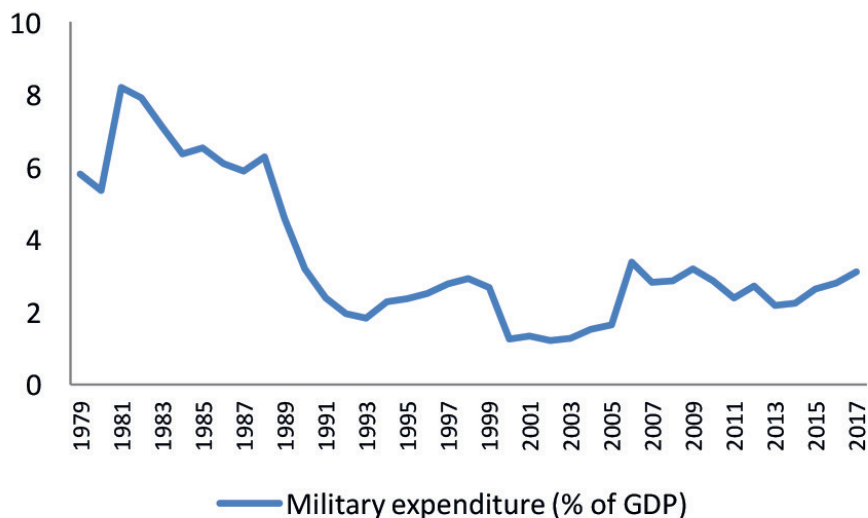
It is clear that in order to achieve growth and prosperity in the country's defense economy sector and reduce military spending, as in other economic sectors, military spending must be directed towards research and development and support for technological innovations. This will increase productivity and efficiency in this sector and the reduction of costs also reduced the negative effects on the country's economic growth and can even help it.

But investment in research and development by non-profit businesses is essentially for production of new goods and services and for improving quality, that causes increase in productivity and efficiency, and ultimately reduces costs. It can be a good example for military sectors to invest in research and development, innovation and cooperation with leading civilian sectors by creating new equipment and advanced products and reducing dependence on foreign countries, increase productivity and efficiency in their organizations and even help by creating employment for educated people and economic growth.

As a result, the defense industry can always have a positive impact on civilian sectors in terms of scientific innovation and technological advancement, in condition that country's macroeconomics can drive military spending toward research and development and support innovation and invention, and ultimately uses defense industry innovations in the civilian sector, which will lead to economic growth. This is the experience of many developed countries that have been able to use the technological advances and innovations of the military sector in the civilian sectors as well, and to cause the economic progress and development of their country.

In this regard, the military expenditures of the Islamic Republic of Iran between the years 1979-2017 have been recorded in Figure 1. As it is known, Iran's military expenditures have had many ups and downs among the studied years. We see an increase in some years, such as the beginning of the imposed war; it has increased with a steep slope.

Therefore, it is clear that the country has paid more attention to military affairs, and due to the regional and trans-regional threats, this increasing in military spending will increase. Therefore, pay attention to the issues that can reduce these costs while maintaining the quality of military affairs should be on the agenda of government officials.

Figure 1.: Military expenditures of the Islamic Republic of Iran between the years 1979-2017

Source: Research results

Therefore, in this study, we will try to examine and analyze the impact of important factors such as research and development costs, the number of recorded inventions and innovations on defense costs in the form of defense economy.

2. LITERATURE REVIEW

Little research has been done on the effects of research and development and innovation on military spending, and most of them has been done on the impact of military spending on economic growth, some of that researches will be mentioned below:

Park (1995), in an article entitled "International Research and Development and Economic Growth of OECD Countries" using data from 10 member countries of this group, examined the research and development activities of the private sector and the public sector and concluded that Private sector research and development activities are more decisive in productivity growth, but government activities have indirect effects due to their foreign interests and can be considered as a factor influencing private sector productivity.

Yildirim and et al. (2005) in a study entitled "Military Expenditures and Economic Growth in the Middle East" between 1989 and 1999, using data panel method, concluded that military expenditures increased economic growth in these countries and Turkey.

Dunne and Nicolaido (2012), in a study examined the effect of defense spending on the economic growth of 15 EU member states during the period 1961-2007. Using combined data, they have concluded that increasing defense spending does not promote economic development.

Lin and et al. (2013), in a study entitled "Are Military Costs Consumed for Social Welfare? in OECD member". Between 1988-2005, in 29 countries of OECD member, they have concluded there is a positive relationship between military spending and two types of social welfare spending. (Education and health care costs). One reason is that OECD member states are more supportive of social welfare programs; therefore, when military spending increases (for example, military personnel), the government can also increase health and education spending.

Khalid and et al. (2015), in a research entitled "Defense Expenditures and Economic Growth in Developed Countries" between 2002-2010 using the GMM method in 67 developed countries of the world, concluded that military expenditures in this Countries have a positive and significant effect on economic growth.

Ajmair and et al (2018), in an article entitled "The Impact of Military Expenditures on Economic Growth of Pakistan" used ARDL approach for annual time series data from 1990 to 2015. The results showed that Pakistan military expenditures are insignificant (military burden for the country is statically insignificant) and number of persons in military are positively and significantly related with GDP growth in long-run. The error correction term is negative and significant which shows that short-run relationship exists among economic growth, military expenditures and number of army persons. In short run military expenditure and number of persons in military are positively and significantly related with GDP growth but in long-run only number of military persons affects economic growth positively and significantly.

Dimitraki and Win (2020), in an article entitled " Military Expenditure Economic Growth Nexus in Jordan: An Application of ARDL Bound Test Analysis in the Presence of Breaks "The relationship between military spending and economic growth during the period 1970-2015 using They examined the Gregory-Hansen convergence method and Autoregressive Distributed Lag (ARDL) test in Jordan. The results showed that during the period of short-term and long-term positive relationship between military spending and economic growth in the country.

3. THEORETICAL FOUNDATION

Defense Economics is a new branch of economic that studies the management of defense spending during periods of war and peace and analyzes the external effects of this expenditure on other sectors of the economy. In general, defense expenditures are considered as expenditures of public goods of an economy, but the defense economy analyzes the relationship between defense expenditures and economic variables through different channels (Ando, 2009). One of these variables is innovation and research and development.

But innovation in general is a kind of change that comes with something new that ultimately leads to practical outputs such as goods, services, methods, structures, or new markets. Innovation is essential for the survival and development of today's organizations, whether private or public, commercial or military, manufacturing or service.

3.1. Types of innovation and its importance in the defense industry

The most famous innovation expert - Schumpeter - believes in five types of innovation: product innovation, process, market, resources and organization. But the three most useful categories are: administrative innovation versus technical innovation; product innovation versus process innovation, and leapfrog innovation versus gradual innovation. The most famous of these classifications is the gradual-jump classification.

By definition, leapfrog innovations are those that have a completely new and different knowledge or technology base or, as a result, have major implications for industry performance and outcomes, but gradual innovations are accompanied by improvements and relative changes in technology or output results.

Gradual-gradual classification can be very important in the defense industry, because:

- **A.** Technology focuses on the activities of the defense industry, and in this industry, the rate of change in technology is usually high, and therefore, an important tool for progress in this industry is technological innovation. Also, the achievements of the defense industry are often manifested in the form of completely new products and technological innovations, or in the form of upgrading existing products or improving them, which can be considered equivalent to gradual and leapfrogging innovation compared to the proposed classification
- **B.** The result of the defense industry's work is mainly the provision of various military products (weapons and equipment) to the armed forces. For the Armed Forces as a user, the impact of new weapons and equipment or the same innovations on the significant improvement of defense (leap) or improvement of defense (gradual) strength is very important.

4. DATA, SPECIFICATION MODELS AND METHODOLOGY

4.1. Data

This study uses annual data series time to Iran from 2000 to 2017, Real Growth Domestic product (GDP) in billions of constant 2010 dollars, Military Expenditures (GDP%) (MEXPE), Technological Innovation (total patent application in the country i.e. both residents and non-residents) (INO), Research and development expenditure (% of GDP) (RD), Arms sales and exports (AEXPO).

In this study, the data are taken from the SIPRI Yearbooks for military expenditure and Arms sales and exports (Stockholm International Peace Research Institute, various years) and the data on GDP, Technological Innovation and Research and development expenditure are drawn from the World Bank Economic Indicators.

4.2. Econometric Methods

Following the, GDP measured is a linear function according to the following equation:

$$GDP_t = f(MEXPE_t, INO_t, RD_t, AEXPO_t) \quad (1)$$

To find the long-run relationship between Real Growth Domestic product, Military Expenditures, Technological Innovation, Research and development expenditure, Arms sales and the following log-linear form is proposed:

$$\ln GDP_t = \alpha_0 + \alpha_1 \ln MEXPE_t + \alpha_2 \ln INO_t + \alpha_3 \ln RD_t + \alpha_4 \ln AEXPO_t + \mu_t \quad (2)$$

All the variables transformed to natural logarithms for the purpose of the analysis. We have used Eviews 10 to conduct the analysis.

5. ECONOMETRIC TECHNIQUES

In this section, we will describe and examine the tests; Augmented Dickey-Fuller Unit Root Test, Autoregressive Distributed Lags Test (ARDL).

5.1. Unit Root Test

First, the Augmented Dickey Fuller (ADF) tests are used to check whether each data series is integrated and has a unit root. The ADF test is based on the value of t-statistics for the coefficient of the lagged dependent variable compared with special calculated critical values. If the calculated value is greater than the critical value, then

we reject the null hypothesis of a unit root; the unit root does not exist, and our variable is stationary (Dickey and Fuller, 1979).

5.2. ARDL Test

The Autoregressive Distributed Lag (ARDL) approach suggested by Pesaran et al. is applicable for variables that are I (0) or I (1) or fractionally integrated. The ARDL framework of Equation 3 of the model is as follows:

$$\Delta \text{LnGDP}_t = a_0 + \sum_{i=1}^n a_{1i} \Delta \text{LnMEXPE}_{t-i} + \sum_{i=1}^n a_{2i} \Delta \text{LnINO}_{t-i} + \sum_{i=1}^n a_{3i} \Delta \text{LnRD}_{t-i} + \sum_{i=1}^n a_{4i} \Delta \text{LnEXPO}_{t-i} + \lambda \text{ECM}_{t-1} + u_t \quad (3)$$

a_0, a_1, a_2, a_3 and a_4 correspond to the long-run relationship in Equation. Where ECM tD1 is the error correction term which is gained from the following estimated cointegration equation:

$$\text{ECM}_t = \text{LnGDP}_t - a_0 + \sum_{i=1}^n a_{1i} \Delta \text{LnMEXPE}_{t-i} + \sum_{i=1}^n a_{2i} \Delta \text{LnINO}_{t-i} + \sum_{i=1}^n a_{3i} \Delta \text{LnRD}_{t-i} + \sum_{i=1}^n a_{4i} \Delta \text{LnEXPO}_{t-i} \quad (4)$$

6. EMPIRICAL ANALYSIS AND RESULTS

Before estimating the model, to prevent false regression, the unit root test should be performed and the stability of the variables should be examined. This test was performed using the generalized Dickie-Fuller (ADF) method and the results were recorded in Table 1. As it is known, all variables except Technological Innovation (INO) are not at the static level, so after once the difference of all variables became static at one level.

Table 1.: Augmented Dickey-Fuller Stationary Test Results

variable	level (0)		variable	level (1)	
	statistics T	prob		T statistics	prob
LnGDP	1.174722	0.6596	DLnGDP	-3.733709**	0.0013
LnMEXPE	-1.651525	0.4363	DLnMEXPE	-4.796001**	0.0019
LnINO	-3.821518**	0.0014			
LnRD	1.380309	0.5668	DLnRD	-4.844347**	0.0017
LnAEXPO	-2.175903	0.2209	DLnAEXPO	-4.607815**	0.0030

Notes: (**) and (***) indicate 5% and 1% significance level respectively

Source: Author's Estimation using Eviews 10.

Now, since not all variables are at the same static level (I (0) and I (1)), Bound

Testing Approach is used to check the existence of a long-term relationship between the model variables. Therefore, the BOUND ARDL test is performed in this section and the results are shown in Table 2. In this regard, considering that if the computational statistic F is greater than the upper critical threshold value, regardless of the collective degree of variables it is possible to reject the null hypothesis that there is no long-term relationship. Conversely, if statistical F test is lower than the lower critical threshold value, the null hypothesis cannot be rejected. Finally, if the test statistic is between the upper and lower thresholds, the result of the test is unclear. Now, according to the statistics obtained from this test, the computational statistic F is greater than the upper limit at the level of 5% (Pesaran and et al, 2001).

Therefore, the existence of a long-term relationship between the variables of the model is confirmed.

Table 2.: ARDL Bound Test Estimation Results

F-statistic	6.609875	
Significance	I (0) Bound	I (1) Bound
10%	2.01	3.1
5%	2.45	3.63
1%	4.84	3.42

Notes: (**) and (***) indicate 5% and 1% significance level respectively

Source: Author's Estimation using Eviews 10.

Now, according to the results, which indicates the existence of a long-term relationship between the variables of the model. By performing the ARDL test, we examine the long-term and short-term relationships between the variables, and the results of the test are given in Table 3.

Table 3: Error correction model (ECM) for short-run elasticity and The Long-run ARDL (3, 0, 0, 3, 0)

The Short-Run Diagnostic Test Results			The Long-run Estimation Results		
variable	Coefficient	prob	variable	Coefficient	prob
DLnINO	-0.38**	0.0539	LnINO	-0.47**	0.0002
DLnRD	-0.37**	0.0388	LnRD	-0.83**	0.0072
DLnGDP	-0.08**	0.0086	LnGDP	-0.005**	0.0011
DLnAEXPO	-0.12**	0.0076	LnAEXPO	-0.15**	0.0093
ECM(-1)	-0.92**	0.0023	C	23.7**	0.0000
R ² : 0.98			Durbin-Watson: 2.2		

Notes: (**) and (***) indicate 5% and 1% significance level respectively

Source: Author's Estimation using Eviews 10.

According to the obtained results, the coefficients of all variables can be interpreted in the short and long-term. In the short-term, with a one percent change in the variables of technological innovations (number of patents registered by domestic residents), research and development costs and economic growth will be 0.38, 0.37 and 0.88 percent of Iran's military costs, will reduce. While the impact of sale and export of weapon on Iran's military spending is positive, a one percent change in this variable will increase military spending by 0.13 percent. But in the long-term, the effect of all variables on Iran's military expenditures was negative, with one percent change in technological innovation variables (number of patents registered by domestic residents), research and development costs, economic growth, sale and export of weapons, 0.47, 0.83, 0.85 and 0.15 will reduce Iran's military expenditures.

What is clear is that the impact of technological innovation and research and development costs on military spending is both short-term and long-term is negative. Although the impact that the two variables have on military spending in the short-term is very close, in the long-term the impact that research and development costs have on military spending is far greater and more significant. By using inventions and new research methods and resulting from research and development, military sector can reduce the costs of this sector and help Iran's defense economy. But the impact of economic growth on Iran's defense economy is far less than the two variables of technological innovation and research and development costs. So that this effect will be less in the long-term. Therefore, the effect of increasing economic growth and thus increasing the country's income and increasing the budget of the military sector on Iran's defense economy, although part of it to acquire and import modern technologies in the military sector and this will reduce military costs, but the effect It is far less important than using inventions and research and development on Iran's defense economy.

But, the sale and export of weapons in the short-term has a positive effect on defense spending because due to increased production for export and, with maintaining quality, more costs should be incurred in this sector, but in the long-term this effect is negative and increase in sale and export weapons can help Iran's defense economy because it can provide part of the cost of research and development and the cost of using inventions in the military sector.

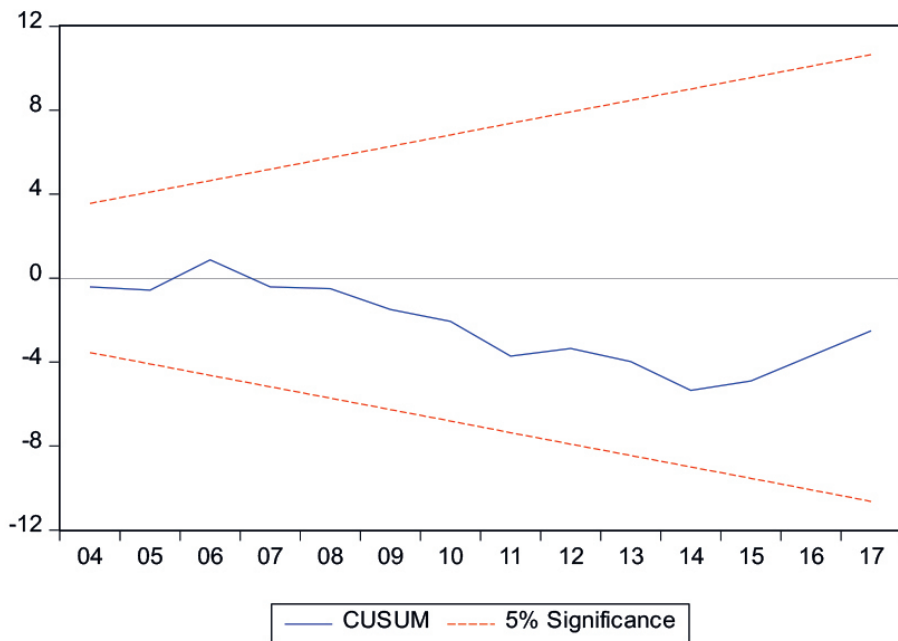
But the main reason for the popularity of Error correction model (ECM) is that short-term fluctuations link variables to their long-term equilibrium values. Error correction coefficient, if displayed with a negative sign, will indicate the error correction speed and the desire for long-term balance. This coefficient shows how many percent of the imbalance of the dependent variable is adjusted in each period and is approaching the long-term relationship. Therefore, the error correction coefficient in this estimate is negative and interpretable, which shows that every year 0.92% of the short-term imbalance is adjusted to achieve the long-term balance. Obtained number for the Error correction model (ECM) indicates the high speed of short-term to long-term adjustment.

In order to investigate the stability of the model coefficients, Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residuals (CUSUMQ) tests have been used. Stability test is used to determine the stability of the model and determine the presence or absence of structural failure. If the obtained statistical chart is in the range between these limits and does not cut them, it can be claimed that the model has the necessary stability and zero hypothesis is accepted based on the absence of structural failure.

In these tests, the zero hypothesis tests the stability of the parameters at a significance level of 5%. The results of the tests are shown in Figures 2. and 3. According to the results of these charts, the statistics of this test were located inside the straight lines, which mean that the coefficients were stable at a significant level of 5%. In other words, the zero hypothesis that the coefficients of stability at the 95% confidence level could not be rejected.

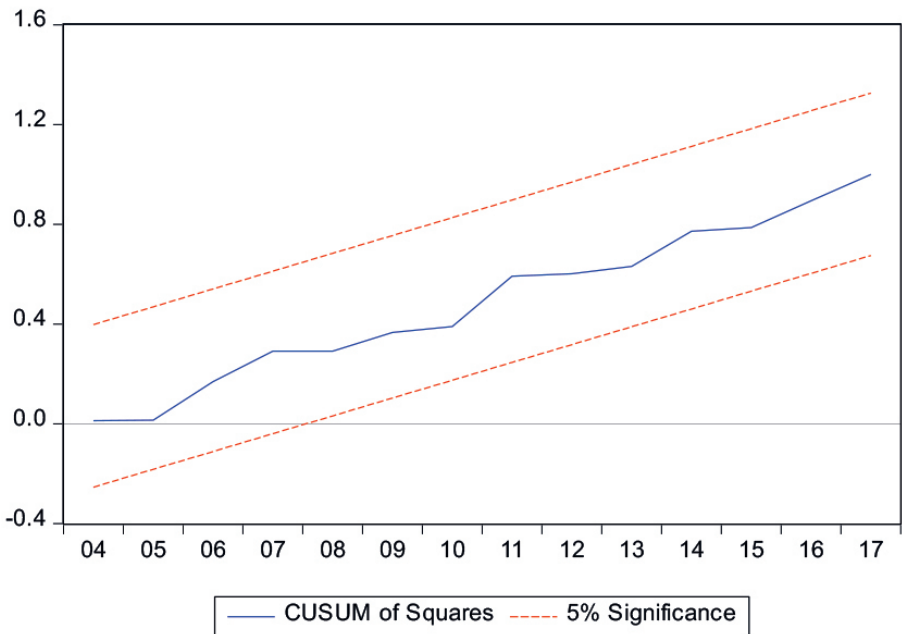
In other words, Figures 2. and 3. show that the estimated model has structural stability at the 5% level and no failure is observed.

Figure 2.: Test CUSUM



Source: Research results.

Figure 3.: Test CUSUMSQ



Source: Research results.

Diagnostic tests were also performed, including White, Breusch-Godfrey and Jarque-Bera. The results are shown in Table 4. The results, in turn, indicate that there is no problem of variance heteroscedasticity, self-correlation, and normal distribution of the disruption components.

Table 4.: Diagnostic tests

Test	Statistic	Prob
White	1.830508	0.3400
Breusch-Godfrey	1.453870	0.4075
Jarque-Bera	0.253545	0.880934

Source: Research results.

7. DISCUSSION AND CONCLUSIONS

What is clear is that in order to achieve growth and prosperity in the country’s defense economy and reduce military spending, as in other economic sectors, military spending must be directed towards research and development and support technological innovation, which will increase productivity and efficiency in this sector and the reduction of costs have reduced the negative effects on the country’s

economic growth and can even help it. Therefore, in this study, by conducting a self-explanatory test with wide interruptions (ARDL) the relationship between the variables of technological innovation, research and development costs, economic growth, sales and export of weapons and military costs in the period of 2000-2017 were examined. In addition, the data used in this study used the statistical information of the World Bank and the Stockholm International Peace Research Institute (SIPRI) and the EVIEWS 10 software was used to estimate the proposed equation. Based on the results, what is clear is that the impact of technological innovation and research and development costs on military spending is negative in both short-term and long-term. Although the impact that the two variables have on military spending in the short-term is very close, in the long-term the impact that research and development costs have on military spending is far greater and more significant. By using inventions and new research methods and methods resulting from research and development, can reduce the costs of this sector and help Iran's defense economy. But the impact of economic growth on Iran's defense economy is far less than the two variables of technological innovation and research and development costs. So that this effect will be less in the long-run. Therefore, the effect of increasing economic growth and thus increasing the country's income and increasing the budget of the military sector on Iran's defense economy, although part of it to acquire and import modern technologies in the military sector and this will reduce military costs, but the effect is less important than using inventions and research and development on Iran's defense economy. But, the rate of sale and export of weapons in the short-term has a positive effect on defense spending because due to increased production for export and, of course, maintaining quality, more costs should be incurred in this sector, but in long-term this effect is negative and increase the rate of sale and export of weapons can help Iran's defense economy.

Because it can provide part of the cost of research and development and the cost of using inventions made in the military sector. The Error correction model in this estimate is also negative and interpretable, which shows that 0.92% of the short-term imbalance is adjusted every year to achieve the long-term equilibrium. The high number obtained for the Error correction model (ECM) indicates the high speed of short-term to long-term adjustment. The results of Cumulative Sum of Recursive Residuals (CUSUM), the Cumulative Sum of Squares of Recursive Residuals (CUSUMQ) also indicate the stability of the model and the absence of structural failure.

But, the results of this study clearly show that investing in research and development and the use of technological innovations can affect the production of new military goods and services and increase quality, and by creating new equipment and advanced products and reducing dependence on foreign countries, productivity and efficiency increase in military organizations and even help create employment for educated people who are prone to economic growth.

For this reason, the country's defense economy can always have positive effects on military and civilian research and development, scientific innovation and technological progress, in this condition that the country's macroeconomics can spend military spending on research and development and support innovation and inventions. Eventually adopt arrangements that use the innovations of the defense industry in the civilian sector, which will lead to economic growth. This is the experience of many developed countries that have been able to use the technological advances and innovations of the military sector in the civilian sectors as well, and to cause the economic progress and development of their country.

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CORPORATE GOVERNANCE AND FINANCIAL PERFORMANCE OF MONEY DEPOSIT BANKS IN NIGERIA

Bilqis Bolanle Amole, Ik, Muo, Kamaldeen A. Lawal

- (1) Accounting and Business Administration Department, Distance Learning Institute,
University of Lagos, Akoka, Lagos. Nigeria.
(2) Department of Business Administration, Olabisi Onabanjo University,
Ago Iwoye Ogun State, Nigeria.
(3) Department of Entrepreneurship Studies, Faculty of Management Sciences, National
Open University of Nigeria, Victoria Island, Lagos
-

Bilqis Bolanle AMOLE

Accounting and Business Administration Department, Distance Learning Institute,
University of Lagos, Akoka, Lagos. Nigeria.
bamole@unilag.edu.ng

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Audit committee; Bank leverages; Board composition; Board size; Board
members; Corporate governance; Financial performance

ABSTRACT

Purpose. *The main cause of distress in the majority of Nigerian banks is poor corporate governance in the country. Corporate governance (CG) is a contemporary subject attracting the consideration of the corporate world, practitioners, consultants, academia and society at large. As a result, this study explores the financial performance (FP) of money deposit banks (MDBs) in Nigeria as a result of corporate governance put in. It went on to investigate the impact of board size and composition, as well as the audit committee, on bank financial performance.*

Methodology. *A descriptive design method was adopted, while secondary data in the form of yearly financial reports of banks selected for the study were obtained and relevant documents via electronic search of databases. Descriptive statistics were used in analyzing the data and an econometric model of panel least square (PLS) regression test was employed for the study.*

Findings and Implication. *The findings affirmed that the correlation between size of board of directors and bank performance was significant, however negative. The results of the study show that the board of directors (BOD) composition significantly influences the FP of MDBs. The study results further reveal that the correlation between size of the audit committee (AC) and FP of MDBs is significant and also a negative one. As a result, based on the empirical findings of the study, it is concluded that CG has a statistically significant influence on the FP of Nigeria's listed money deposit banks. Mechanisms such as the large size and composition of the board as well as the size of the audit committee encourage a negative impact on the FP. In line with the foregoing, the study recommended that an effort be made to improve CG, in the sense that the number of directors on board should be kept to a desirable level, and that the ratio of executive directors to non-executive directors, as well as the size of the audit committee, is kept at an optimal level.*

1. INTRODUCTION

The customary way of operation of corporate governance (CG) around the world has been identified as vital in all economic dealings, particularly in developing economies like Nigeria that are coming to maturity (Alashi, 2005). Globalisation versus technological advancement has made the financial domain in Nigeria to response to fresh products or services; and as such, those regulating the financial sectors are eager to evaluate and control the shifts in the upheaval (Sandeep, Patel and Lilicare, 2002; Mansur and Tangl, 2018). Not to mention the rise in mergers and acquisitions in the banking sector. Regardless of these activities, there is a call for Nigeria to foster a healthy financial system, particularly in the banking sector, along with effective corporate governance. This affirms that a sound CG implies that effective utilisation of collective available wealth by controlling shareholders, translates into a more effective allotment of resources and efficient FPs. This is because stakeholders will want to reinvest their resources in that bank with clear CG practices, which ensures that the cost of capital is minimal and hence service as a determinant of firm financial performance (Qi et al., 2002).

According to Hanrahan, Ramsay and Stapledon (2001), one of the crucial parts in ameliorating corporate governance and firm value, is the ratio of executive directors to non-executive directors of the firm. In the sense that the firm's value can be made better, due to the fiduciary roles carried out by the board, and this includes overseeing the activities of management and recruiting employees for the firm. In addition, the board appoints and monitors the operation of both internal and external auditors to increase the organisational value. Furthermore, the directors are able to settle disputes that might arise within the firm and, as such, help trim down the firm's agency costs. The board of directors plays a crucial function by ensuring an increase in the firm's value in the sense that they not only oversee the firm but also compel the firm's manager to choose indifferent conclusions (Tomasic, Pentony and Bottomley, 2003; Paniagua, Rivelles, and Sapena, 2018).

In addition, the widely accepted belief regarding the desirable size of a board is that there is an inverse relationship in terms of the numbers of directors sitting and the firm's general performance. This is based on the fact that the activities such as coordination and communication of tasks, as well as the potency of the decision-making among the prominent directors is difficult and expensive when compared to the smaller numbers of directors (Belkhir, 2006; Mohan and Chandramohan, 2018). Reducing the number of board directors to a specific number has been shown to improve the organization's operations in all aspects. Notwithstanding, the advantages of large numbers of directors in a firm carrying out oversight functions are outweighed by more inadequate communication and irregularities in making decisions. A review of literature has shown that the number of board size tends to give the same decision: A large board is probably not being efficient in essential matters of impor-

tant subjects among themselves, in overseeing operations of the firm. According to Lipton and Lorsh, (1992), big board size is usually not effective and simple for CEOs to manage. And as such, this study considers the size in terms of number of directors on a firm's board to be of major importance in the operation of every successful firm.

Furthermore, the concept of audit committees differs consistent with the goals, functions, and tasks assigned to them (audit committee). The conception is that the audit committee serves as a committee composed of non-executive directors in the establishment and the major reason behind having or forming the audit committee is to increase the level of auditing quality and monitoring the activities of the board of directors (Al-Thuneibat, 2006). According to Arun and Turner (2009), the audit committee serves as a group of individual/persons from the board of directors' members, and is responsible for retaining the independence of the auditor. Hence, this study is explored as a value added (eye opener) to the continuing discussion on the consideration of the existence of an association between corporate governance and FP of MDBs in Nigeria. Diverse and debatable findings as well as results have come up from prior studies, particularly those in the developed economies such as China, the United Kingdom, United States of America (USA), Australia, Italy, Korea, Germany, Sweden, Japan, Switzerland, Finland, the Netherlands and France amid many other economies.

1.1. Problem Analysis

In Nigeria, underprivileged corporate governance is recognized as one of the core elements in virtually recognized situations of bank distress in Nigeria. According to Soludo (2004), weak corporate governance is defined as excessive risk taking, feeble internal control structures, overriding of internal control measures, ignoring of prudent lending rules, and nonexistence of risk management functions, absence/non adherence to authority limits, fraudulent practices, and insider ill-treatments. In line with this assertion, the Nigeria Security and Exchange Commission (SEC) reported that "corporate governance was at a rudimentary stage, as only about 40% of quoted companies, including banks, had recognized codes of corporate governance in place" (Central Bank of Nigeria, 2006). As a result, there is a breach in public (people) trust, particularly in commercial banks, especially if the criteria put in place are not checked by financial regulators.

Corporate governance has received increased attention because of high-profile scandals involving abuse of corporate power and, in some cases, alleged criminal activity by corporate officers. Despite, the fact that Code of Corporate Governance for Banks in Nigeria was issued to enhance the practices within the banking industry, during the implementation of the code; it was observed that certain provisions could not be implemented by banks in view of their ambiguity and/or conflict with the provisions of the Companies and Allied Matters Act (CAMA) 1990. Furthermore,

in 2009, a joint CBN/NDIC examination that led to the removal of 5 CEOs of banks in the country revealed, amongst others, poor corporate governance practices in the institutions. There was also the need to update the code in order to align it with contemporary developments and international best practices. (Central Bank of Nigeria, 2014).

Moreover, in tandem with the view of Sanusi (2010) where he asserted that “banking sector problems in Nigeria have been associated with corporate governance abuses within the amalgamated banks, which have therefore become a way of life in many areas of the sector”. Furthermore, Sanusi (2010) emphasized that corporate governance in the financial sectors failed due to the fact that boards of directors in these financial sectors failed to adopt these practices on the basis that they are being misled by top management and involving themselves in securing un-assured loans, the majority of which come from depositors, and not providing moral justifications for impossibility. The vast number of CG studies focused on Nigeria, as well as the diversity of corporate governance codes within the poor institutional climate plagued by corruption, makes the case for Nigeria especially compelling. In certain cases, specific codes clash with one another, which would have ramifications for regulatory enforcement by Nigerian public companies (Adegbite 2013). Hence due to the above problem analysis, this paper set out to investigate corporate governance and financial performance (FP) of MDBs in Nigeria. The following research questions guided the study: board size effect on FP of MDBs in Nigeria; board composition influence on FP of MDBs in Nigeria; and the extent to which audit committees affect FP of MDBs in Nigeria.

Hypotheses Formulation. Based on the problem analysis above, the study formulated the following hypotheses:

Ho1: The size of the board of directors will not have a significant relationship with FP of MDBs in Nigeria

Ho2: The composition of board of directions in MDBs will not have significant association with FP of MDBs in Nigeria

Ho3: The size of the audit committee will not have a significant relationship with FP of MDBs in Nigeria.

1.2. Study Scope and Delimitation

The study centered on six (6) selected quoted banks in the Nigerian stock exchange (NSE): Union Bank of Nigeria Plc (UBN), Guaranty Trust Bank Plc (GTB), United Bank for Africa Plc (UBA), First Bank of Nigeria Plc (FBN), Zenith Bank International Limited (ZB) and WEMA Bank Plc (WB) from 2007-2016. These banks were chosen using convenient sampling techniques based on the fact that the researcher could only access the annual reports of the aforementioned banks as at the time of study. This is due to the fact that the issues concerning the transparency as

well as corporate governance are crucial in our banking sector today. In addition, the study covers three (3) vital components of corporate governance: Size of the board and their composition and as well as the size of the audit committee; Return on Assets was proxy as measures of the banks' performance, while bank size and bank leverages serves as control variables. The data gotten were extracted the audited financial statements of the banks i.e. GTB, FBN, UBA, ZB, UBN and WB, for a 10-year period that is, within the period of 2007-2016 which were downloaded from the banks respective corporate websites.

2. REVIEW OF LITERATURE AND THEORETICAL FRAMEWORK

2.1. Theoretical Review of Corporate Governance

There are numerous theories that are relevant to corporate governance in understanding the relationships between different aspects of corporate governance. However, because of the tenets of these theories, the basic disciplines in which it lays on Economics, Management, Psychology, and Sociology, which are currently being practiced in Nigerian banks, the theoretical review embedded in this paper revolves around the three theories. These theories are Agency theory, Stakeholder theory and Stewardship theory (Yap, Selah, and Abessi, 2011).

2.1.1. Agency Theory

The theory's central premise is that large companies have separate ownership and power. In such companies, managers (agents) are employed to work for the owners (principals) and make decisions on their behalf in order to optimize shareholder returns (Jensen and Meckling, 1976). This theory tries to address the specific issues between the principal (shareholders) of a company and agents (managers). On the other hand, the agency theory of corporate governance views shareholders as the principals and management as their agents. Agents, on the other hand, will behave in their own best interests: as employee directors of a corporation, they will aim to optimize their cash compensation, work security, and other benefits, and will do nothing more than satisfy shareholders. Instead, they must be supervised and regulated to ensure that the interests of the principals are preserved. The bulk of today's corporate governance practice in Nigeria is based on this principle, especially in the Nigeria Banking Industry.

In relation to this extant theory, Habbash (2010) noted that "corporate governance enhances corporate performance by resolving agency problems through monitoring management activities, controlling self-centered behaviors of management and inspecting the financial reporting process". On the other hand, in order to trim down the agency cost by positioning the disputing claims from the officials as well as

their shareholders via overseeing the operations and as well as using various corporate governance processes. Hence, these processes, which include board compositions as well as audit committees, enable the shareholders to intimately oversee the operations of the top level of officials. Also, when the audit committees as well as the boards are not performing up to the task, the top official may take advantage of the situation to engage their personal interests. On the other hand, they are effective in their oversight functions. They tend to reduce the not too good attitude of the top officials by discovering the fraudulent activities they usually engage in (Sanda, Mukaila and Garba, 2005). In addition, Habbash (2010) noted that “the assumptions of agency theory, CG processes affect financial performance”. Consequently, the financial performance of banks can be improved by their improvement and transparency in the corporate governance processes. Board structure has to some great extent banked on the principles of agency theory, centering on the controlling roles played by the board. Hence, the corporate governance processes that are been centered upon in this paper consist of the size of the board and audit committee size.

2.1.2. Stakeholder Theory

This is an annex of the theory of agency that anticipates the board of directors (BOD) to represent the concerns of the shareholders. According to this theory, the main goal of the firm is to dish out and organize stakeholders’ interests, that is the shareholders, government, suppliers, creditors, employees, customers, and the community. Furthermore, CG stakeholders can improve the outside environment, which contributes to the achievement of corporate goals. On the other hand, stakeholders in corporate governance enable firms to consider not only the satisfaction of customers, but also the community and social organizations, resulting in a stable environment for long-term growth. In addition, Maher and Andersson (1999) posited that “the benefit of the stakeholder model lays emphasis on overcoming problems of underinvestment associated with opportunistic managerial behaviour and in encouraging active co-operation amongst stakeholders to ensure the long-term profitability of the business firm”.

Stakeholder theory, as proclaimed by Kyereboah-Coleman, (2007), affirmed that “the best firms are the ones with committed suppliers, customers, employees and management. Recently, the stakeholder theory has received greater attention than earlier because researchers have recognized that the activities of a corporate entity impact on the external environment, requiring accountability of the organization to a wider audience than simply its shareholders”. As such, companies are no longer the instruments to satisfy the shareholders alone but exist within society. It has responsibilities to the stakeholders. However, most researchers argue that it is an unrealistic task for the managers (Sundaram and Inkpen, 2004; Sanda et al., 2005). More so, the stakeholder theory precisely has not been subjected to extant/

much prior empirical study. The common criticism of the stakeholder theory in the previous studies was its challenge to alignment of the stakeholders' conflicting interests as the difficulties have to do with accommodating different stakeholders with various needs and demands.

2.1.3. Stewardship Theory

This theory was developed by Donaldson and Davis (1989) as a normative complement to the agency theory of corporate governance. On the other hand, the stewardship theory is based on sociology and psychology. Managers, according to the stewardship principle, are not guided by personal agendas, but rather are stewards whose motivations are aligned with the goals of their principals' shareholders (Davis, Schoorman, and Donaldson, 1997). When the firm's espoused principles are consistent with the enacted values, this article argues that managers' stewardship behavior results in outstanding corporate governance practices (Subramanian, 2018). According to the stewardship viewpoint, stewards (managers) are fulfilled and inspired when organizational performance is achieved, even if it means sacrificing personal objectives (Abdullah and Valentine, 2009). Furthermore, although the agency theory indicates that separating the roles of board chair and CEO would protect shareholder interests, according to the stewardship principle, appointing the same person to the positions of board chair and CEO maximizes shareholder interests by giving the CEO more responsibility and autonomy as a steward in the company (Donaldson and Davis 1991).

2.2. Empirical Review of the Past Literature

Ozili (2021) conducted a recent literature review of recent corporate governance research in Nigeria. It identifies the recent advances and challenges in the literature and suggests some directions for future research. The findings from the literature review reveal that the board of directors is the most explored corporate governance determinant in the Nigerian corporate governance literature. Most studies focus on some corporate governance determinants, and ignore other corporate governance determinants in firms.

According to Asogwu (2016), Nigeria's banking sector has seen corporate failures in the past due to lack of corporate governance structure. Rather than analytical views, his study offers a theoretical context and a model for understanding the principle of corporate governance. This was accomplished by defining corporate governance theory, corporate governance model, corporate governance processes, and legal structures. The study concluded that the key setback to corporate governance in Nigerian banks is non-adherence to principles.

In the works done by Fanta, Kemal and Waka (2013), their study assessed the

relationship between selected internal and external corporate governance mechanisms and bank performance as measured by ROE and ROA. The study used a structured review of documents, and commercial banks' financial data were collected covering the period 2005 to 2011. Board size and the existence of audit committees on the board had a statistically significant negative effect on bank performance.

Ajola, Amuda and Arulogum (2012) explored the influence of corporate governance on bank's performance in Nigeria within a five-year period and using correlation and regression analyses. They discovered that the size of the board and their firm's financial performance exhibit significant but negative relationship. Bawa and Lubabah (2012) critically looked into the role of corporate governance and FP in Nigeria using 12 selected banks within the period of 5 years, i.e. 2006-2010. In their study, they also discovered that there exists a substantial but negative link between the size of the board of directors and their company profitability. Meanwhile, the research conducted by Akpan and Roman (2012) using selected 11 banks in Nigeria with the aid of regression analysis came to a conclusion that is consistent with what Asuagwu (2013) discovered in his study, noting that "smaller board sizes positively and significantly enhance performance." Furthermore, Yoshikawa and Phan (2003) in their study findings affirmed that "larger board sizes increase agency costs."

Anderson, Mansi and Reeb (2004) reasoned that "a larger board is better than a smaller board size in that larger board sizes have the ability to push the managers to track lower costs of debt because creditors believe that such firms are more effective monitors of the accounting process". This assertion corroborates the results of Adeusi, Akeke, Aribaba, and Adebisi (2013), where they noted that "an increased number of board sizes increases the performance of banks". Uzma, Ummara, Sundas, Farhat, and Rabia, (2018) empirical study on the internal corporate governance and financial performance nexus using banks of Pakistan affirmed that Pakistan as a country has a comprehensive code of corporate governance. However, banks don't make best use of proper implementation.

Kajola (2008) studied the role of corporate governance and its influences on the performance of organizations in the country (Nigeria). He did so by using listed banks within the period of 2000 and 2006. His findings show that the connection between the banks' performance and their board composition is not significant. This finding is in tandem with the view of some studies such as Bhagat and Black, (2002), Sanda et al, (2005); Adeusi et al, (2013); Bawa and Lubabah (2013). In addition, Kajola (2008) asserted that "the performance of banks tends to be worse when there are more external board members". Nonetheless, Prakash and Martin (2001) found that a well-balanced ratio between executive directors and non-executive directors had a significant influence on the performance of these banks in their study of twenty-nine Nepalese banks from 2005 to 2011. Similarly, this view is in tandem with the view of Bawa and Lubabah (2013), Kamau (2018), as well as Ezzamel and

Watson (1993).

The corporate governance code emphasizes the composition of the board which should include members with qualitative, qualified, experienced and as well as proven integrity (Bawa and Lubabah, 2013). Sanda, et al, (2005) reasoned that "the proposition of board composition is to help reduce agency problems. From this position, a positive relationship is expected between firm performance and the proportion of outside directors sitting on the board". Klein (2002) and Benerd, Chraoune and Courteau (2004) reasoned that "the ability of the board of directors to monitor and advise a firm, depends on their influence, competence and experience as this will reduce fraud and increase performance."

Furthermore, Poudel and Hovey (2012) noted that "shareholders' interests are protected through the activities of audit committees because management may not always act in the interest of a corporation's owners". In addition to the aforementioned, larger audit committees assert that increasing the number of people involved in overseeing the operations of top officials brings or reduces any fraudulent act that might want to occur, and thus improves performance. However, other scholars such as Kajola, (2008), Hardwick, Adams and Zou (2003) documented that there exists no significant correlation between firm performance and their audit committee size. The focus of Prakash and Martin's research is that it provided a reasonable intuition that both the interests of shareholders and financiers are protected by individuals who are difficult to control, particularly when they are large in number.

2.3. The Nexus between Corporate Governance and Financial Performance of Money Deposits Banks in Nigeria

One of the significant changes in the corporate governance history of Nigeria is the current treatment of the country's apex bank, the Central Bank of Nigeria (CBN). Similarly, the constant fall that has been undergone in the sector is as a result of ineffective corporate governance and the merger and acquisitions of banks compelled the CBN to enact new corporate governance outlines to the banks operating (in service) in Nigeria precisely in February 2006. According to CBN (2006), the framework known as the "Central Bank of Nigeria Code for Corporate Governance for Banks' in Nigeria Post Consolidation" was created to "challenge the issue of poor corporate governance and create a sound banking system in the country." The code has introduced more stringent requirements in the area of industry transparency, equity ownership, criteria for the appointment of directors, board structure and composition, accounting and auditing, risk management and financial reporting".

According to Tandelilin, Kaaro, Mahadwartha and Supriyatna, (2007), the fundamental focus in most prior literature and discussion analysis in studies around the globe on corporate governance has been majorly focused on the structure of ownership and its processing. They further noted that "whether the kind of ownership

structure matters and what its effects on corporate governance are areas that raise concerns.” Corporate governance has been enlightened as that process which links them with among investors, financiers, board of directors, shareholders, and the top officials in knowing the direction and performance of the corporation (Wheelen and Hunger, 2006; Kamau, 2018).

In addition, the main reason for bringing about a corporate governance system in Nigeria came via the functions of the Nigeria Securities and Exchange Commission (SEC). A Code of Best Practices for public firms in Nigeria was adopted by the Securities and Exchange Commission (SEC, 2003). It was noted that the code was done by choice and is considered to dig into business practices that are good, and of criteria for auditors, directors, and as well as the members of the boards.

2.4. The role of Corporate Governance in managing the challenges in the Nigerian Banking Industry

Though the merger and acquisition process in the banking sector in Nigeria has led to a lot of benefits, it failed to surmount the main disadvantage according to the corporate governance of these banks. This is exemplified by the vast rush in capital availability at a time when banks have no or little implementation of corporate governance touchstones.

In the words of Sanusi (2010), “it is well known in the industry that since consolidation, some banks have been engaging in unethical and potentially fraudulent business practices and the scope and depth of these activities are documented in recent CBN examinations.” Governance missteps among the amalgamated banks have thus become the norm in the sector, enriching a few at the expense of investors/depositors. Sanusi (2010) showed that “corporate governance in many banks failed because boards ignored these practices for reasons, including being misled by executive management, participating themselves in obtaining un-secured loans at the expense of depositors and not having the moral justification to enforce good governance on bank management.” Also, the audit processes in most of the banks do not look fully into the fast declination of the growth and development of the nation’s economy and, as such, there is a need for promoting fast-growing provision against risk to assets.

As banks’ assets and modes of operation continue to grow, the boards of banks have mostly failed to fulfill their roles and have been lulled into a sense of eudemonia by the apparent yearly increases in their profits and size. In retrospect, the board of directors in some major banks did not have the necessary equipment to oversee their firms. While most CEOs of banks expect unquestioning obedience on the board, and as such, do not have the independence, hence, lack to make substantial decisions to protect the success of the bank.

The Central Bank of Nigeria (2010) revealed details on the extent of insider abuse in many countries’ banks, revealing that “CEOs set up Special Purpose Vehi-

cles (SPVs) to lend money to themselves for stock price manipulations or the purchase of estates all over the world.” For instance, one bank borrowed money and purchased private jets which the Apex bank later discovered were registered in the name of the CEO’s son. In another bank, the management set up 100 fake companies for the purpose of perpetrating fraud.” Sanusi (2010) also revealed that “thirty percent (30%) of the share capital of Intercontinental bank was purchased with customer deposits. Afribank used depositors’ funds to purchase 80% of its initial public offering (IPO). It paid N25 per share when the shares were trading at N11 on the NSE and these shares later collapsed to under N3.” Furthermore, according to CBN (2017), “the CEO of Oceanic bank controlled over 35% of the bank through special purpose vehicles/entities (SPVs) borrowing customer deposits.” As a result of the stock market’s decline, withdraw these customer deposits totaling N300 billion. As a result, the capital amassed by the so-called “mega banks” was fictitious capital, or run money deposits in short.

3. RESEARCH METHODS

The study adopted a descriptive research design method. The time series data was gathered from the financial annual reports of chosen MDBs. The data used consists of three major corporate governance constructs: board size, composition, and Audit committee, while ROA was used as a measure of bank performance because it measures how efficiently a company can manage its assets to produce profits. Bank size and bank leverages were used as control variables from 2007 to 2016. The sample size for this study was six (6) selected quoted MDBs on the Nigeria stock exchange, and it included: GTBank Plc, FBN Plc, UBA Plc, Zenith Bank Ltd, UBN Plc and WEMA Bank Plc, within the period of 2007-2016 (Appendix 1.). These banks were chosen using convenient sampling techniques based on the fact that the researcher could only access the annual reports of the aforementioned banks at the time of study. The data was collected mainly from published annual reports of these banks, i.e. downloaded from their corporate websites over the period of 2007-2016.

This study embedded in this paper an improved form in terms of the econometric exemplary of work done by Miyajima, Omi and Saito (2003). The model can be symbolized as:

Model (1)

$$ROA = f(BSize, BCom, AudSize, FSize, FLev\mu) \quad (1a)$$

The explicit form of equation (1a) is written as

$$ROA = \beta_0 + BSize\beta_1 + BCom\beta_2 + AudSize\beta_3 + FSize\beta_4 + FLev\beta_5 + \mu \quad (1b)$$

log linearize equation (1b) we have

$$\log ROA = \beta_0 + \log BSize\beta_1 + \log BCom\beta_2 + \log AudSize\beta_3 + \log FSize\beta_4 + \log FLev\beta_5 + \mu \quad (1c)$$

where

ROA	=	Return on Assets (used as proxy for bank performance)
"BSize"	=	"Board Size of Banks"
BCom	=	Board Composition
AudSize	=	Audit Committee Size of Banks
Fsize	=	Bank Size (Use as Control variable)
Fleverage	=	Bank Leverage (Use as Control variable)
μ	=	Error Term
β_0	=	the γ -intercept of the model
$\beta_1, \beta_2, \dots, \beta_5$	=	Coefficient of the independents constructs.

4. RESULTS AND ANALYSIS

This part of the study shows the results analysis of panel least square and it has two parts. The first part is the descriptive statistics which summarizes the core features of the study variables such as mean, median, min. and max. Standard deviation while the second section gives the regression results report of PLS estimation output of the regression model.

Table 1.: Descriptive Statistics

	LOGROA	LOGBSIZE	LOGBCOMP	LOGAUDSIZE	LOGFSIZE	LOGFLEV
Mean	-2.627445	2.524365	-0.450552	1.468538	7.685203	2.527502
Median	-2.743000	2.564900	-0.385700	1.386300	7.619500	2.590800
Maximum	-1.452000	2.708100	-0.211500	1.791800	8.638200	2.901400
Minimum	-4.106800	2.184900	-0.891600	1.098600	6.930700	1.957300
Std. Dev".	0.729028	0.127799	0.152902	0.207299	0.469710	0.207917
Skewness"	-0.029789	-0.921215	-0.927842	-0.332480	0.272210	-0.771034
Kurtosis"	1.592365	3.242794	3.080533	2.373759	2.297612	3.239822
Jarque-Bera	4.962467	8.633748	8.625115	2.085870	1.974355	6.088728
Probability	0.083640	0.013342	0.013399	0.352419	0.372627	0.047627
Sum	-157.6467	151.4619	-27.03310	88.11230	461.1122	151.6501
Sum Sq. Dev.	31.35742	0.963627	1.379363	2.535411	13.01704	2.550545
Observations	60	60	60	60	60	60

Source: Authors' Eview Output, 2017.

Looking at the Table 1., it shows the descriptive statistics indicating all the mean values for the construct are positive. The mean value for dependent variable Return on Asset (ROA) is 2.627445, while the mean values for the independent variables Board Size (BSize), Board Composition, (BCom), Audit committee Size (Aud-

Size), Bank size (FSize) and Bank leverages (BLev) were computed to be 2.524365, -0.450552, 1.468538, 7.685203 and 2.527502. Also, the standard deviation of Return on Assets, (ROA), Board Size (BSize), Board Composition, (BCom), Audit committee Size (AudSize), Bank size (FSize) and Bank leverages (FLev) were calculated to be: 0.729028, 0.127799, 0.152902, 0.207299, 0.469710, 0.207917.

The minimum values indicate the lowest point of the variables throughout the study period. The minimum values for ROA were -4.106800, while the minimum values for independent variables i.e. Board Size (BSize), Board Composition, (BCom), Audit committee Size (AudSize), Bank size (FSize) and Bank leverages (BLev) were: 2.184900, -0.891600, 1.09860, 6.930700 and 1.957300 respectively. The maximum values also indicate the highest point of the variables throughout the study period. The maximum values for ROA was 1.452000, while the maximum values for independent variables i.e. Board Size (BSize), Board Composition (BCom), Audit committee Size (AudSize), Bank size (FSize) and Bank leverages (BLev) were: 2.708100, -0.211500, 1.791800, 8.638200 and 2.901400 respectively. Skewness shows the asymmetry of the likelihood distribution of a real random variable about its mean. From the Table 1., the skewness of all variables excluding FSize is Negative, which means that all the variables except FSize are skewed to the left.

4.1. Empirical results

The study critically looked into the relationship between corporate governance and bank performance in Nigeria, within the period of 2010-2016. In an attempt to capture the essence of this study, Panel Least Square (PLS) was employed in this study. The significance of the t-statistics are the p-values highlighted by the predictive software used as the basis for decision making.

$$\log ROA = \beta_0 + \log BSize\beta_1 + \log BCom\beta_2 + \log AudSize\beta_3 + \log FSize\beta_4 + \log FLev\beta_5 + \mu \quad (1c)$$

$$\log ROA = -5.33 - 0.73BSize - 0.14BCom - 0.32AudSize + 0.064FSize + 0.19FLev \quad (2)$$

Where

ROA	=	Return on Assets proxied for bank performance
BSize	=	Board Size of Banks
BCom	=	Board Composition
AudSize	=	Audit Committee Size of Banks
Fsize	=	Bank Size (Use as Control variable)
Fleverage	=	Bank Leverage (Use as Control variable)
μ	=	Error Term
β_0	=	the γ -intercept of the model
$\beta_1, \beta_2, \dots, \beta_5$	=	Coefficient of the independents construct.

Table 2.: Panel Least Square Estimation

Variables	Coefficients	Std. Error of the Estimate	t-Statistic	Probability
LOGFSIZE	0.064385	0.070193	0.917258	0.3635
LOGBCOMP	-0.141051	0.073977	-1.906687	0.0277
LOGAUDSIZE	-0.316954	0.162062	-1.955757	0.0239
LOGFLEV	0.195341	0.156091	1.251455	0.2167
LOGBSIZE	-0.733039	0.295741	-2.478649	0.0167
C	-5.358236	0.826308	-6.484554	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.920473	Mean dependent var	-2.627445	
Adjusted R-squared	0.904243	S.D. dependent var	0.729028	
S.E. of regression	0.225595	Akaike info criterion	0.023991	
Sum squared resid	2.493762	Schwarz criterion	0.407955	
Log likelihood	10.28026	Hannan-Quinn criter.	0.174181	
F-statistic	56.71428	Durbin-Watson stat	1.986094	
Prob(F-statistic)	0.000000			

Notes: Dependent Variable: LOGROA; Method: Panel Least Squares.

Source: Authors Computation, 2017.

The Table 2. displays the panel least square results, the R-Square value, which is the ratio of changes in the dependent variable Return on Asset (ROA), which can be predicted from the constructs, size of boards (BSize), composition of boards, (BCom), size of the Audit committee (AudSize), Bank size (FSize) and Bank leverages (BLev) of the six selected banks. This value indicates that 92.1% of the changes in Return on Assets (ROA) scores can be predicted from Board Size (BSize), Board Composition, (BCom), Audit committee Size (AudSize), Bank size (FSize) and Bank leverage (BLev). The adjusted R-square, on the other hand, attempts to provide a close value to the estimate; thus, the adjusted R² value of 90.4% shows the actual changes in the Return on Assets (ROA), which is due to the change in construct understandings; Board Size (BSize), Board Composition (BCom), Audit Committee Size (AudSize), Bank Size (FSize), and Bank Levers (BLev).

Also, the estimate of the standard error, which can also be called the root mean square (RMS) error, is 0.060939. It indicates the existence of other variables and factors that can significantly influence the Return on Asset when not taking account of Board Size (BSize), Bank size (FSize) and Bank leverages (BLev). Furthermore, the Durbin-Watson statistics of 2.0 will show the absence of serial correlations or autocorrelation. As such, the DW value of 1.986094 is close to the benchmark, and this indicates that there is no serial correlation or autocorrelation problem of regression in the models. The F-statistic (56.71428) is significant at 5% level since the probability of its value (0.0000) is less than the 0.05 significance level. This simply

implies that the test is statistically significant and the model can be used for further speculation.

H₀₁: The size of the board of directors will not have a significant relationship with FP of MDBs in Nigeria

In the first proposition, without verification, it is presumed that the size of the board of directors will not have a significant relationship with FP of MDBs in Nigeria. In relation to the data analysis, the t-statistics of Board Size is negative (-2.478649), with a p-value of 0.0167 which is significant at only 5%. This suggests that there exists an inverse correlation between the size of the board of directors (SBOD) and the FP of the selected MDBs. Based on these results, H₀₁ was not supported and, as such, its alternate hypothesis, which states that the size of the board of directors has a significant relationship with FP of MDBs in Nigeria, was supported. This means that when making financial decisions, the size of the board should not be considered, even if the size of the board is a desirable number.

H₀₂: The compositions of board of directors in MDBs will not have a significant relationship with FP of MDBs in Nigeria

In the second proposition, it is assumed that the composition of board of directors in MDBs will not have a significant relationship with FP of MDBs in Nigeria. From the analysis, the t-statistics of board composition is negative (-1.906687), with a p-value of 0.0277, which is significant at only 5%. This indicates that there is also an inverse but significant correlation between the composition of board of directors of MDBs and their FP. Consequently, H₀₂ was hence not supported while an alternate hypothesis which states that the composition of board of directors in MDBs has a significant relationship with FP of MDBs in Nigeria was held. This by extrapolation means that board composition must be put into consideration while taking financial decisions as it affects the performance of MDBs.

H₀₃: The size of the audit committee will not have a significant relationship with FP of MDBs in Nigeria

Lastly, it is anticipated that the size of the audit committee will not have a significant relationship with FP of MDBs in Nigeria. From the analysis, the t-statistics of audit committee size is negative (-1.955757), with a p-value of 0.0239 which is significant at only 5%. This affirmed a significant negative relationship between audit committee size and the FP of the selected MDBs. As a result, H₀₃ was not supported by the alternate hypothesis which states that the size of the audit committee has a significant relationship with FP of MDBs in Nigeria.

4.2. Discussion of Findings

The study assessed corporate governance and FP of MDBs, with particular reference to some MDBs in Nigeria. In line with the paper results, a significant negative relationship was found between board size and ROA was in line with the findings as reported by Loderer and Peyer (2002), and Muhammad (2018). They reported that there was a significant negative (-) link between board size and the performance of a firm. The findings of Conyon and Peck (1998) asserted that "a large board size leads to the free-rider problem where most of the board members play a passive role in monitoring the firm." More so, the members of the board become affected in no adaptive disputes in the sense that the board is not in tune with board members and, as such, not achieving desirable goals, which in turn affects the development of the firm (Pathan, Skully and Wickramanayake, 2007). Meanwhile, the findings contradict Kyereboah-Coleman and Biekpe (2005), as they asserted that there is "a positive relationship between a bank's value and board size". Similarly, the result above contradicts the view of Zahra and Pearce (1989) who maintained that "a large board size brings more management skills and makes it challenging for the CEO to manipulate the board."

Moreover, the study affirmed that there was a significant bond between board composition and FP of MDBs in Nigeria. This ultimately shows that the composition of the board should be taken into account or recognized in the process of executing financial decisions, whereas in the third result, it was acknowledged that there was a significant link between audit committee size and FP of MDBs. The result was in accordance with empirical studies conducted previously (Aldamen, et al., 2011). Kyereboah-Coleman (2007) points out that "the size of the audit committee negatively influences the performance of Ghanaian banks." This study corroborated the view, which asserted that the optimal size of an audit committee is efficient or adequate for the quality of financial reporting as well as to increase banks' performance.

5. CONCLUSION AND RECOMMENDATIONS

This study examines corporate governance and FP of MDBs in Nigeria, with specific reference to six (6) selected MDBs: GTB Plc, WB Plc, FBN Plc, UBN Plc, UBA Plc, as well as ZB Plc. Based on the panel least square results, the study concluded that there is a significant relationship between the size of the board of directors and the FP of MDBs in Nigeria. It was also clear that there was a significant relationship between the nature of the board of directors' composition and the FP of MDBs in Nigeria, and that there was a statistical relationship between audit size and the FP of MDBs in Nigeria. Conclusively, corporate governance has a significant effect on the FP of enumerated MDBs in Nigeria. As a result, machineries such as the size of the board of directors, the ratio of executive directors to non-executive directors, and

the audit size committee, both individually and collectively, have a significant impact on the FP. The key policy implication of these findings is that regulatory authorities in Nigeria can spasmodically use corporate governance mechanisms as a policy gear to fix and regulate the going concern of the MDBs in the banking sectors in Nigeria.

The study made the following recommendations, which are in tandem with the empirical findings:

1. There is a need to concentrate on the stock ownership value of the members of the boards in order to enhance corporate governance, since empirical findings assert that it has a positive connection to both the performance and the likelihood of correcting the management in banks that are not doing well.

2. People who advocate for board independence should put into consideration that there exists a negative (-) link between high board independence and FP. As such, when clamoring for board independence in order to enhance performance, then the put in place might be a misleading effort. On the other hand, if the creation of the board independence is to discipline and carry out oversight functions on the bank managers that are not performing, then board independence creation is for a good and reliable cause.

3. In addition, independent directors can deliver an effective oversight function, if the financial regulatory bodies ensure that banks present extra disclosure of financial ties between directors and banks' CEOs. Furthermore, banks may be permitted to experiment with minor variations from the usual "super-majority independent" board to having only 1 or 2 inside directors.

4. Necessary moves should be taken for banks to have compulsory abidance with the code of CG. And that an efficient legal structure that assigns the rights and duties of banks must be developed.

5. Finally, a unified corporate body should be set up. This body should be given the functions of gathering and ordering corporate governance information with proper indices to enable and foster research on corporate governance in the country.

This study has gone some way in researching the role in which corporate governance played in influencing FPs of banks. Since this study concentrates on the banking sector in Nigeria, further studies could inquire into how to get a lighter understanding of the roles of corporate governance (CG) in other sectors in the country and how it affects their financial performance. Such studies could deal with the resemblances and departures of the roles of corporate governance in other sectors of the country.

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Appendix 1: Time Series Data of variables in Money Deposit Banks (2007-2016)

Bank	YEAR	LogROA	LogBComp	LogBSize	LogAudSize	LogFSize	LogFLev
GTB	2007	-3.3116	-0.3711	2.5649	1.3863	7.3904	2.5908
GTB	2008	-3.3123	-0.3425	2.6391	1.6094	7.5519	2.7298
GTB	2009	-3.1341	-0.3567	2.6391	1.3863	7.6623	2.6123
GTB	2010	-3.3496	-0.3711	2.5649	1.0986	6.9878	2.4186
GTB	2011	-3.3873	-0.4155	2.4849	1.0986	7.3288	2.1078
GTB	2012	-2.8771	-0.3711	2.5649	1.0986	7.3904	2.0643
GTB	2013	-3.1033	-0.3857	2.6391	1.3863	7.5519	2.5908
GTB	2014	-3.1281	-0.3711	2.6391	1.3863	7.6623	2.7298
GTB	2015	-3.1917	-0.4005	2.6391	1.6094	8.3871	2.6123
GTB	2016	-2.9337	-0.3011	2.7081	1.3863	8.6382	2.5915
Wema	2007	-2.0084	-0.5440	2.5649	1.6094	7.8417	2.3795
Wema	2008	-1.7585	-0.6162	2.6391	1.3863	8.0235	2.6741
Wema	2009	-1.8819	-0.6162	2.5649	1.6094	8.1772	2.9014
Wema	2010	-1.7841	-0.8916	2.4849	1.6094	6.9307	1.9573
Wema	2011	-2.1866	-0.7765	2.5649	1.3863	7.3333	2.3795
Wema	2012	-2.1029	-0.8440	2.5649	1.6094	7.6195	2.6741
Wema	2013	-2.0084	-0.6162	2.6391	1.3863	7.8417	2.9014
Wema	2014	-1.7585	-0.6162	2.5649	1.3863	8.0235	2.5471
Wema	2015	-1.8819	-0.6539	2.6391	1.6094	8.1772	2.7160
Wema	2016	-1.4520	-0.6349	2.6391	1.3863	8.3104	2.7305
FBN	2007	-3.4013	-0.3567	2.3026	1.3863	7.5519	2.6101
FBN	2008	-3.1800	-0.3425	2.3026	1.3863	7.6623	2.6603
FBN	2009	-3.1370	-0.3425	2.4849	1.6094	8.2030	2.5177
FBN	2010	-3.2249	-0.3711	2.4849	1.7918	7.1929	2.5787
FBN	2011	-3.4673	-0.3425	2.4849	1.6094	7.2631	2.8214
FBN	2012	-3.7854	-0.3567	2.3026	1.7918	7.3288	2.6101
FBN	2013	-3.5370	-0.3425	2.3026	1.3863	7.3904	2.6603
FBN	2014	-3.3382	-0.3425	2.4849	1.3863	7.5519	2.5177
FBN	2015	-3.1725	-0.3425	2.6391	1.6094	7.6623	2.4114
FBN	2016	-3.0303	-0.3857	2.4849	1.6094	8.2030	2.2925
UBA	2007	-3.7247	-0.5978	2.4849	1.3863	6.9307	2.2976
UBA	2008	-3.4489	-0.6349	2.5649	1.6094	7.3333	2.4186
UBA	2009	-3.2330	-0.6349	2.5649	1.6094	7.6195	2.5265
UBA	2010	-4.1068	-0.3011	2.4849	1.7918	8.3871	2.1576
UBA	2011	-3.7247	-0.5978	2.5649	1.3863	8.6382	2.2976
UBA	2012	-3.4489	-0.6349	2.5649	1.6094	6.9307	2.4186
UBA	2013	-3.2330	-0.6349	2.7081	1.6094	7.3333	2.5265
UBA	2014	-3.0555	-0.6349	2.4849	1.7918	7.6195	2.6239
UBA	2015	-2.9048	-0.4943	2.7081	1.6094	7.8417	2.7127
UBA	2016	-2.7739	-0.5276	2.6391	1.6094	8.3871	2.7942
Zenith	2007	-1.7513	-0.3425	2.4849	1.7918	6.9307	2.5455

Zenith	2008	-1.7196	-0.3857	2.3026	1.0986	7.3333	2.6005
Zenith	2009	-1.6888	-0.3011	2.4849	1.0986	7.6195	2.6525
Zenith	2010	-1.8181	-0.3567	2.4849	1.7918	8.6382	2.4257
Zenith	2011	-1.7841	-0.3425	2.4849	1.0986	6.9307	2.4874
Zenith	2012	-1.7513	-0.3857	2.3026	1.6094	7.3333	2.5455
Zenith	2013	-1.7196	-0.3425	2.4849	1.7918	7.6195	2.6005
Zenith	2014	-1.6888	-0.3857	2.3979	1.0986	7.8417	2.6525
Zenith	2015	-1.6589	-0.3011	2.4849	1.0986	8.0235	2.7020
Zenith	2016	-1.6299	-0.5978	2.6391	1.3863	8.1772	2.7492
UNION	2007	-2.1123	-0.2124	2.5649	1.0986	7.3904	2.0643
UNION	2008	-2.1211	-0.3857	2.6391	1.3863	7.5519	2.5908
UNION	2009	-2.1202	-0.3711	2.6391	1.3863	7.6123	2.7298
UNION	2010	-2.1901	-0.2115	2.6391	1.6094	8.3871	2.6123
UNION	2011	-2.5370	-0.3425	2.3026	1.3863	7.3904	2.6603
UNION	2012	-2.3012	-0.3425	2.4849	1.3863	7.5519	2.5177
UNION	2013	-2.1195	-0.3425	2.6391	1.6094	7.6623	2.4114
UNION	2014	-2.1303	-0.3857	2.1849	1.6094	8.2030	2.2925
UNION	2015	-2.7121	-0.3857	2.1849	1.3863	6.9307	2.2976
UNION	2016	-2.6124	-0.5978	2.6391	1.3863	8.1241	2.1492

Source: Authors Computation.

INFORMATION AND COMMUNICATION TECHNOLOGY CAPABILITIES AND BUSINESS PERFORMANCE: THE CASE OF DIFFERENCES IN THE CZECH FINANCIAL SECTOR AND LESSONS FROM ROBOTIC PROCESS AUTOMATION BETWEEN 2015 AND 2020

Martin Zelenka, Marek Vokoun

Department of Informatics, Faculty of Economics, Technical University of Liberec,
Liberec, Czechia

Department of Economics and Management, Faculty of Social and Economic Studies,
Jan Evangelista Purkyně University, Ústí nad Labem, Czechia

Marek Vokoun

Department of Informatics, Faculty of Economics,
Technical University of Liberec, Liberec, Czechia
marek.vokoun@ujep.cz

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ABSTRACT

This paper analyzes the rapid onset of Robotic process automation (RPA) technologies in the Czech financial sector between 2015-2020. The development and experience from the "hype-and-fear" phase contributed to business process integration and technological spillovers are expected in the future. If ICT capabilities are the source of performance differences, then most likely candidates are inventory and finances business process integration and implemented Enterprise Resource Planning and Customer Relationship Management systems. The RPA should not be seen only as simple automation but as a complex instrument offering a lot of advantages with a focus on benefits for internal and external stakeholders.

PURPOSE. *The goal is to qualitatively analyze the experience with RPA implementation and quantitatively assess ICT capabilities via analysis of differences between various organizational ICT activities and types of companies in the Czech financial sector.*

DESIGN/METHODOLOGY/APPROACH. *The qualitative case study was performed in the bank ČSOB, a.s. in 2019, respondents, owners of processes in the final part of automation, were chosen randomly from different departments of the bank. Data for the quantitative part comes from the ICT survey (Czech Statistical Office), business performance dataset (EMIS) and a case study about ICT capability implementation. Differences are assessed and indirectly interpreted using goodness-of-fit approach.*

FINDINGS AND IMPLICATIONS. *The results from the RPA case study revealed that the Czech financial sector is past the "hype and fear" phase and many companies focused on their return on investment and are beginning to focus more on other stakeholders. According to this development, the requirements and outputs are suggested in the phases of RPA implementation. The possible source of profitability performance differences are integrated business processes.*

LIMITATIONS. *Financial sector data are anonymized in ICT surveys and the measurement of the competitive advantage of ICT capabilities is only indirect. Qualitative approach is suggested with focus on technological efficiency measurement using data development approach.*

ORIGINALITY. *This paper provides an understanding of the strong experience in RPA in Czech financial sector. Certain initial setbacks in RPA are expected and this paper suggest to focus on knowledge management (lessons learned) and other requirements influencing the successful RPA prototyping and implementation process.*

1. INTRODUCTION

The Information and Communication Technology (ICT) capabilities of enterprises are key resources for a business's success. Activities like the Business Process Integration (BPI) and Robotic Process Automatization (RPA) allow us to connect systems, people and information efficiently and in terms of overall business strategy.

The linkages between enterprise capabilities and business performance are not as straightforward as one would expect. The most empirically and theoretically studied capabilities are marketing capabilities. Kamboj and Rahman (2015) reveal a positive relationship between "doing great" in the marketing capability dimension and business performance. However, the relationship between some of the marketing capabilities and business performance appears to be negative or interdependent on factors from the strategic behavior of enterprises. In the study by Kaleka and Morgen (2019) feedback loop effects are suggested. Some promotional marketing capabilities (new subscriptions, free to try licenses, trial versions, etc.) are expected to have a negative effect on profits in the current accounting period and a positive effect in the future (Vokoun and Pichová, 2020).

There are many marketing capabilities which are based on the "old marketing mix" processes (product, price, place, and promotion) and combined with new technologies and scientific knowledge. Today's marketing mix requires Industry 4.0 technologies like the Industrial Internet of Things (IIoT) and ICT knowledge-intensive services like automatization and Artificial Intelligence (AI). That is why we focus on the ICT aspect of business processes, namely the information processes in the enterprise information system (EIS, list of processes by Annisa, Senses and Noprisson, 2017). Those processes require ICT skilled labor and management with the ability to process data and information especially about customers or clients, hardware and software proficiency in general, as well as other business environment aspects (intellectual property rights, globalization tendencies, cybersecurity, compliance, etc.).

The goal of this paper is to analyze the differences in ICT capabilities according to the size of the enterprise and sector of the financial industry. We selected four types of financial services according to the NACE classification: life and non-life insurance, monetary intermediation, auxiliary financial and insurance services, and other financial services. The theoretical foundations are based on the Resource-Based View theory of information systems (Gupta et al., 2018) and dynamics (evolutionary nature) of complex systems (Malerba and McKelvey, 2020). ICT capabilities can directly and dynamically influence business performance and this paper explores this relationship. The selected factors of ICT capabilities are state of BPI, systems implementation and software development.

The Czech financial sector is a very competitive and innovative industry in comparison to other European countries (Hes and Jilkova, 2016). Clients (from the pri-

vate and public sectors) enjoy innovation when it comes to financial services. This rapid development in Financial Technologies (FinTech) places high demands on process innovation and cost reductions. The market of financial services is changing due to the so-called "FinTech revolution" (banks granting access for the 3rd parties to their system). So, there is great potential for Application Programming Interfaces (APIs), Robotic Process Automation (RPA), Artificial Intelligence, the Internet of Things and Distributed Ledger Technology (DLT).

In the case of RPA, banks are mostly aiming to lower costs when it comes to routine manual work and to deliver tangible added value to the client (Mager, 2019). The term robotic process automation most commonly refers to configuring the software to do the work previously done by people (Lacity and Willcocks, 2016). There are predictions that RPA smart solutions can completely replace human workers (Carr, 2015). If the software cannot completely replace them, then at least free them from routine jobs (Ford, 2017). Public sector regulations can handle the impact of the new technologies but these regulations are slow and have a rather ambivalent impact (Mendling et al., 2018).

The RPA applications are usually adopted along with machine learning (ML) innovations. However, it is not widespread and the RPA applications still need to become "smarter" while we also need processes that can discover incorrect decisions which can otherwise remain unnoticed (van der Aalst, Bichler, Heinzl and 2018). The RPA skill belongs to a special set of skills and competencies for the digital transformation of enterprises. It is used in combination with cloud computing, agile program management, cybersecurity and business process management (Andriole, 2018).

Because data does not allow for the direct assessment of the capability performance relationship, this paper also summarizes the most important knowledge from current academic research and analyzes (semi-structured interviews) the RPA potential (as performance influencing ICT capability) in the Czech financial sector. This is done by a case study of critical factors for RPA implementation. This paper not only takes a look at the processes of financial institutions but also if RPA can be used in all enterprises in application areas like financial management and accounting, IT infrastructure maintenance and front-office processing. The automation of pharmaceutical safety is currently using artificial intelligence and RPA to automate the processing of adverse event reports (Schmider et al., 2019).

The robotic process automation and business process integration are rarely covered as a topic in the Web of Science or Scopus database. There were around 30 papers or proceedings currently in both databases at the end of 2019 when we prepared our first case study and there are about 30 new articles at the end of May 2021. The most cited paper is about annual returns on investment (ROI) of the RPA of routine back-office processes at Telefonica O2 (Lacity and Willcocks, 2016). The paper gives a great background for those looking to do RPA research.

The ROI was around 200 % and five "RPA Action Principles" were suggested also by companies operating in different industries. Firstly, a controlled experiment is suggested to test RPA capabilities. There are certain criteria for determining which processes can be automated. For example, processes which are: high-volume, standardized or strongly rule-based and mature processes. The next suggestion is to bring IT on board early because of IT security and change management policies. People will start fearing that RPA technology is going to take their job. Therefore, it is necessary to communicate the intended effect on jobs early in the RPA project. The last suggestion is to look for more sourcing options, like insourcing (buying licenses) with or without consulting services; and outsourcing via RPA, cloud RPA or other Business Process Outsourcing (BPO) providers (Lacity and Willcocks, 2016).

Three lessons for internal RPA adoption are suggested by Hallikainen, Bekkhus and Pan (2018). Again, the role of the IT department is crucial. It needs to be involved in the development, testing and production phases of the RPA project. Concerns of key employees about losing jobs have to be addressed by managers while employees have to feel comfortable when adapting to the change. The last suggestion is to select processes that are rules-based and require significant amounts of time and resources and the improvements have to be measured and evaluated. External RPA adoption is more suitable for organizations with hybrid structures. The high level of long-term trust between BPO and the enterprise is key for providing value-added to clients.

The RPA is a topic of many conferences and this last part of the literature review aims at the most interesting findings. What can be automated and how? Anagnoste (2018) provides a list of many specific processes and sub-processes in the finance sector and supply-chain management. According to the results, chat-bots and intelligent optical character recognition will be the source of the RPA boom in other industries.

The OCR smart technology can be used in RPA with 90% efficiency in semiconductor manufacturing (Lin et al., 2018). RPA development can use the basic principles of workflow recording. Screen recording and Test-driven development are used in an agile and efficient way (Cewe, Koch and Mertens, 2018). The adoption of RPA is not easy because it is not smart enough and cannot be implemented in every organization. Principles of adoption and the expert process of identifying the most suitable for RPA is proposed by Bourgouin, Leshob and Renard (2018). The first step is to validate the process eligibility for RPA, then there is an evaluation of the RPA potential of the process. The third step is the evaluation of the RPA relevance when it comes to the process and the last step is the classification of the process for RPA.

There are leading RPA platforms like UiPath Studio, Automation Anywhere and Blue Prism. The first one seems to be the most valuable automation tool on the market (Issac, Muni and Desai, 2018). The manufacturing of defective products is a problem that can be solved by RPA implantation even in metal products manufacturing (Fominykh et al., 2018). The future of RPA and RPA platforms is introduced by

(Anagnoste, 2017: 686): "The next 'big thing' in RPA is the integration of Artificial Intelligence solutions so that robots will understand when issues arise and will take decision(s) in order to solve it."

Recent coronavirus pandemics only increased the high demand for automatization and digital transformations in the Czech financial sector. There are promising knowledge spillovers (Ng et al., 2021) between RPA experienced sectors and sectors with a high potential like building and construction, smart product-service systems, portfolio management, aviation and supply chain. Pandemics also increased the high demand for the social assistance practices which can be redefined using RPA as human-technology hybrid actor social services (Ranerup and Henriksen, 2020).

2. MATERIALS AND METHODS

We used standard statistical hypotheses testing using χ^2 tests (goodness-of-fit) to assess possible sources of competitive advantage. The hypotheses are aimed at the differences between 4 branches of financial enterprises (Table 1.) and variables that relate to business process integration, as well as other ICT activities (Table 2.). Additionally, we also tested hypotheses about the differences between the size of the enterprise (Table 3.) and other variables of interests (Table 2.). In case of hypotheses testing (Table 6. and Table 7.), we only allowed for 5% statistical significance level (denoted as alpha 5 %** and alpha 1%***).

Table 1.: The frequency of the types of economic activities, based on the Czech Statistical Office data (2015)

Abbr.	Type	NACE	Freq.	Percent	Cum.
AUX	Auxiliary activities	661-663	120	46.88	46.88
MON	Monetary intermediation	641	42	16.41	63.28
OTH	Other financial service activities, except insurance and pension funding	649	56	21.88	85.16
INS	Insurance and reinsurance	651-652	38	14.84	100

Source: authors.

Data about ICT activities in 2014 comes from the Czech Statistical Office (CZSO) official survey. The latest 2015 ICT dataset for scientific use does not contain all business process variables and newer datasets have not been published yet. The questionnaire contains all kinds of questions regarding the use of ICT (Czech Statistical Office, 2015); however, the financial performance indicators are not included. Only some of the economic activities (industrial sectors) from the financial sector are

analyzed (Table 1.). Almost half (46.9 %) of the sample is represented by financial enterprises that are characterized by activities auxiliary to financial services and insurance activities (AUX). Banks, savings banks and credit unions are represented by 16.4 % and labeled as monetary intermediation (MON). There are 21.9 % leasing, factoring and consumer credit enterprises that are labeled as other financial services (OTH). The last group is represented by 14.8 % and consists of life and non-life insurance and reinsurance enterprises (INS).

The statistical summary of variables used in the results section are provided in Table 2. The variation coefficients of all variables are quite high. There are differences between companies based on their size (Table 3.) and industry type (Table 1.). On average, almost half of all enterprises have CRM and ERP systems. CRM data about clients are available to other information systems in 45 % of the enterprises in the sample. About 21 % of enterprises develop their SW in-house. The most integrated business processes are in finances (54 %) and operations (31 %).

Table 2.: Statistical summary of enterprises' characteristics and variables of interest, based on the Czech Statistical Office data (2015)

Characteristics of enterprises	N	Mean	SD	Max
IT workers (internal and external)	256	13.7	52.02	549
Programmers (internal and external)	256	4.13	16.75	205
In-house SW developers/programmers (% of time - development)	256	26.92	37.86	100
Number of in-house SW developers (non-programmers)	256	4.81	30.76	344
In-house SW developers/non-programmers (% of time - development)	256	12.66	26.7	100
SW in-house development	256	0.21	0.41	1
SW external development (outsourcing/cooperation)	256	0.65	0.48	1
ERP system implemented	256	0.46	0.5	1
CRM system implemented	256	0.49	0.5	1
CRM data available to other IS	256	0.45	0.5	1
Business process integration - inventory	256	0.2	0.4	1
Business process integration - finances	256	0.54	0.5	1
Business process integration - operations, services	256	0.31	0.46	1
Business process integration - logistics	256	0.24	0.43	1

Source: authors.

The last variable is used for additional testing between the sizes of enterprises. In the data sample, there are only 2 micro-enterprises with 1 or fewer employees. The company sizes are well represented given the fact the analysis is in the 4 branches of the financial sector (Table 1.) where there are medium-sized to large companies (Table 3.). Unfortunately, the ICT survey does not contain business performance variables.

Table 3.: Statistical summary of enterprises' characteristics and variables of interest, based on the Czech Statistical Office data (2015)

Number of Employees	Freq.	Percent	Cum.
0 to 9	52	20.31	20.31
10 to 29	74	28.91	49.22
30 to 99	69	26.95	76.17
100 plus	61	23.83	100

Source: authors.

Business performance is measured indirectly in a data sample covering the financial sector in 2015. The dataset comes from the EMIS (2020) database. The sample covers 218 enterprises from the 4 groups (AUX, MON, OTH, INS). It is a comparable sample to the ICT survey because the same enterprises are participating in the CZSO ICT survey and represents the Czech financial market in those four categories well.

Table 4.: Statistical summary of 2015 financial performance, based on the EMIS data (2020)

Number of Employees	Freq.	Mean	Std. Dev.	Min	Max
Profit before income tax	218	429.40	2052.23	-218.19	17940.00
Return on Equity (ROE) (%)	217	22.29	81.44	-636.36	725.72

Source: authors.

The RPA case study research was performed in the bank ČSOB, a.s. In 2019, more than 30 processes were automated. To prevent selection bias, respondents were chosen randomly from different departments of the bank. The research was performed on the owners of fully automated processes or owners of processes in the final part of automation (babysitting). The research question was aimed at their experience with RPA implementation.

This research covers 13 processes from different units of the bank (Retail back-office, Corporate back-office, HR, Compliance and Credits). The size measured in

full-time employees (FTE) and maturity level is described in Table 5. The maturity of the process is measured by the Capability Maturity Model (McKay, 2019).

Table 5.: The number of processes in the study.

Maturity/Size	<0,5 FTE	0,5-2,0 FTE	<2 FTE	Total
Level 1 - Initial	0	0	0	0
Level 2 - Repeatable	1	0	1	2
Level 3 - Defined	1	2	1	4
Level 4 - Managed	1	3	1	5
Level 5 - Optimizing	0	1	1	2
Total	3	6	4	13

Source: authors.

3. RESULTS

First, we present differences in ICT activities and compare them with the differences in business performance. In the first case, there are differences between the four branches (auxiliary activities, monetary intermediation, other financial service activities, except insurance and pension funding and Insurance and reinsurance) and ICT capabilities. Auxiliary activities were mostly the cause of differences in the case of business process integration of inventory activities and the case of the ERP system. The ratio of in-house and external SW development, BPI of operations and logistics were the same in all four branches (Table 6.) and were not a distinctive ICT capability in the financial sector.

Table 6.: The relationship between economic activity (4 branches) and ICT capabilities

Business process integration, 4 branches	Pearson χ^2	p-value
Business process integration - inventory	10.5	0.015 **
Business process integration - finances	9.2	0.026 **
Business process integration - operations, services	2.3	0.512
Business process integration - logistics	4.3	0.230
ERP system implemented	16.0	0.001 ***
CRM system implemented	12.9	0.005 ***
CRM data available to other IS	14.3	0.003 ***
SW in-house development	1.3	0.725
SW external development (outsourcing/cooperation)	0.5	0.917

Source: authors.

The size was a factor of variability in the case of business process integration (inventory and finances), ERP system integration and the ratio of in-house SW development. The direct relationship between size class (ordinal category) was observed in the case of inventory BPI (from 5% to 20%) and in-house SW development (from 11 to 31 %). In other cases, there were no differences (Table 7.).

Table 7.: The relationship between the number of employees (size category) and ICT capabilities

Business process integration - inventory	Pearson χ^2	p-value
Business process integration - inventory	19.6	0.000 ***
Business process integration - finances	9.4	0.024 **
Business process integration - operations, services	3.9	0.274
Business process integration - logistics	1.0	0.795
ERP system implemented	15.2	0.002 ***
CRM system implemented	2.4	0.498
CRM data available to other IS	1.8	0.606
SW in-house development	6.9	0.076
SW external development (outsourcing/cooperation)	0.4	0.941

Source: authors.

Business performance was measured using three variables. The financial sector is specific because there are no traditional sales like in manufacturing or other services. The revenues from loans and fees are a poor measure of business performance. In the banking sector, a more relevant indicator is the ability to avoid costs, generate profit and boost equity (Tier 1 capital). That is why these two indicators are preferred.

Table 8.: The relationship between the number of employees (size category) and ICT capabilities

Variable	Branch	Obs.	Mean	Std. Dev.	Coeff. of Var.	Min	Max
ROE (%)	MON	39	16.3	29.0	178%	-16.6	100.0
ROE (%)	OTH	63	10.3	105.7	1026%	-636.4	485.3
ROE (%)	INS	28	13.0	35.3	272%	-116.0	100.0
ROE (%)	AUX	87	36.6	86.5	236%	-111.5	725.7
EBT	MON	39	2062.2	4541.7	220%	-218.2	17940.0
EBT	OTH	63	118.5	199.6	168%	-78.5	808.3
EBT	INS	29	46.7	100.2	215%	-28.0	510.4
EBT	AUX	87	50.1	78.9	157%	-26.3	384.6

Source: authors.

The variability of all indicators is substantial and variation coefficients (standard deviation to mean ratio) are too high to allow for the direct comparison of the means (Table 8.). The ranges of the means (mean plus one standard deviation) are substantially different. The highest and lowest profits are generated in the branch of monetary intermediation. The range of the mean in case of return on equity is the widest in the other and auxiliary activities. However, only in the case of other financial services, the coefficient of variation indicates a substantive high-risk premium (variation) in this industry.

Table 9.: The relationship between the number of employees (size category) and business performance

Variable	Size Class	Obs.	Mean	Std. Dev.	Min	Coeff. of Var.	Max
ROE (%)	0 to 9	41	24.0	176.0	-636.4	733%	725.7
ROE (%)	10 to 29	28	25.7	29.9	-6.1	116%	87.3
ROE (%)	30 to 99	66	24.7	36.6	-67.8	148%	180.9
ROE (%)	100 plus	76	15.8	28.5	-116.0	180%	100
EBT	0 to 9	41	9.2	20.6	-9.5	224%	84.3
EBT	10 to 29	28	25.0	42.9	-26.3	172%	180.2
EBT	30 to 99	67	67.6	101.3	-37.8	150%	578.8
EBT	100 plus	76	1154.6	3369.8	-218.2	292%	17940.0

Source: authors.

As in previous analysis, the variability of all indicators is substantial and variation coefficients are too high to allow for the direct comparison of the means (Table 9.). Microenterprises (9 and fewer employees) have the widest ranges of both indicators. It indicates a high-risk environment. Since the analysis is indirect, we can only assume a relationship between the ICT capabilities and those performance indicators. If ICT capabilities are the source of performance differences, then most likely candidates are inventory and finances business process integration and implemented ERP and CRM systems (see Table 6. and Table 7.). Data about financial institutions are mostly anonymized or unavailable and research in this field is complicated. The next case study about RPA sheds some light on the interdependence of people, data and other dimensions of the information system of the enterprise.

RPA Implementation: a qualitative case study

The interviews were done separately using a semi-structured questionnaire with open questions. Questions aimed to cover all phases of the RPA process (1. process selection/preparation, 2. automation implementation, 3. business-as-usual working). The results presented in this paper are based on six interviews with the owners of the processes and one control interview with a consultant providing services in the area of business architecture in ČSOB a.s. and other banks. This control interview can eliminate potential bias.

The first key finding was that RPA as a method is not a source of main complications in RPA implementation. This conclusion is based on the fact that none of the interviews mentioned any trouble connected directly to the RPA itself. There was no mention of technical issues nor problems with the development of robotic algorithms and bugs causing a delay, etc.

A very important finding is that RPA is a lot about changing workers' mindset. Nearly all respondents mentioned that their workers had feared losing control over their processes. This slowed down the whole implementation. Also, employees responsible for granting access to company systems often denied access rights to robots. The same problem was with setting up new methodology or standards including software robots in the process. Their results regarding the responsible employees of RPA implementation suggest a combination of process skills, communication skills and programming skills which are not easy to find on the labor market.

The next finding is connected to the process of maturity. If the maturity of the process is low, then the RPA seems to bring more complications than savings. Process analysis and its optimization are necessary for RPA implementation and cannot be omitted. If so, there is probably a high risk of bugs during the implementation. The RPA is more complex and should not be seen only as a solution for every routine job, unless the process analysis was already done. The maturity of the process also influences the meeting of expectations in several FTE savings. Immature processes saved less FTE because more tasks had to stay in the hands of human workers.

From a more technical point of view, there is an issue of input data quality. Software robots need precise working interfaces which are not easy to achieve. The robot works better in the beginning and at the end of a process. The cooperation of the human worker and robot in the middle of a process may cause delays or mistakes. On the other hand, the output of robots seems to be without mistakes. This could lead to better data quality within the company in the future. Not only does data quality play a crucial role but also the quality of systems in which the robot operates. The efficiency of the robot is dependent on system reaction times. If it is implemented on slow systems (or on systems with a long system recovery time) it will not meet the full potential.

Issues connected to the RPA discovered in previous research were very similar to our findings. In our case study, we showed that proper process selection is based on maturity (Lacity, Willcocks, 2016), on rule-based criterion (Hallikainen, Bekkhus and Pan, 2018), employees mindset awareness, integration of business processes, sharing data and information and IT involvement in the RPA targeted process (Lacity and Willcocks, 2016).

The implementation of RPA can be divided into 4 phases (Figure 1.) in each different factor that has an impact on outputs from each phase. Factors can be seen also as requirements because its quality decides if the RPA project will be successful or not. The IT departments and ICT workers are essential when it comes to the smooth RPA development (Lacity and Willcocks 2016; Hallikainen, Bekkhus and Pan, 2018).

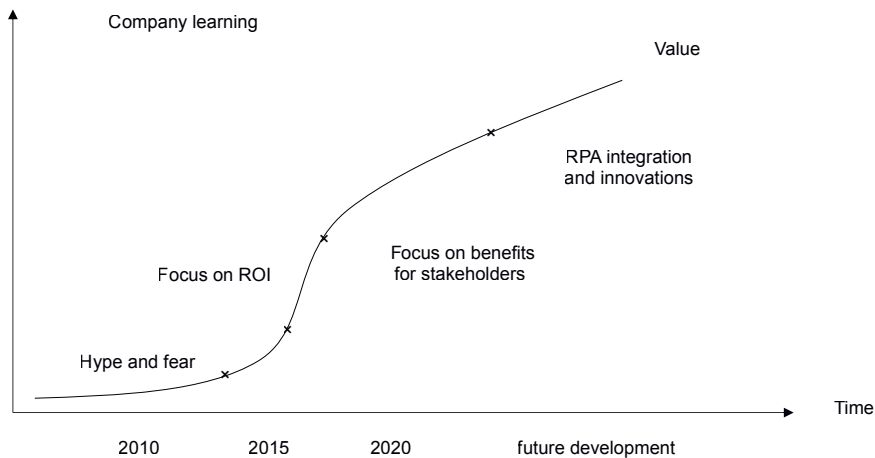
Figure 1.: The factors influencing the RPA implementation process, our own elaboration based on Lacity, Willcocks (2016), Hallikainen, Bekkhus, Pan (2018)

Requirements	Phase	Outputs
Early IT department onboarding Criteria for process selection Employee's awareness Sourcing decision RPA project team selection Risk management procedures	Preparation	Business process candidates for RPA A solution team RPA Directives
IT involvement Deep analysis of processes (UMP, BPMN) Communication rules Interface preparation	Implementation	RPA prototype optimized RPA processes ready to be used Lesson learnt
IT support Communication roles	Babysitting	Solution optimized Lesson learnt
IT support (response time) Knowledge management Business process reengineering	Production	Increased effectivity and data quality, flexibility Strategy changes

Source: Authors.

The Czech financial sector is in the second phase of RPA evolution (Figure 2.). It is important to notice the RPA projects have feedback using lessons learned and changes in the local or overall strategy which leads to a correction in the selection of a process suitable for RPA within the company. This back-loop can also affect the funding of RPA and treating risk. This growth is possible thanks to a recent FinTech development (Hes and Jilkova, 2016).

Figure 2.: The development of the RPA in the Czech financial sector, our own estimation based on RPA evolution in Lacity and Willcocks (2018) and case study results



Source: Authors.

The value taken from this research is in the analysis of the interfaces between automated processes and processes done in the traditional way (including human workers). It is the first analysis of RPA in the Czech financial sector and it is based on a rather old data set (2014.) and interview in one of the larger banks in the Czech financial sector. Further research should focus on critical factors of RPA implementation and the “organizational culture and human labor impacts”. There is also the question of losing knowledge and skills by which human workers may suffer. From a technical point of view, the RPA is only a bridge to more sophisticated IT innovations. It is expected that AI together with RPA will influence the labor market by increasing productivity in other services as well.

4. CONCLUSION AND DISCUSSION

There is a strong growth potential for the RPA in the banking sector (NACE 64.1). Given the development and experience from the “hype-and-fear” phase, technological spillovers are expected in private sector and thanks to the “bank citizen identity” authentications services in the public sector as well. It is given by the highest average number of programmers (ICT skilled workers) in comparison to other non-IT services.

The level of the business process integration is mostly high or highest in the area of inventory, finances, CRM, logistics and operations in the banking sector, insurance, other financial services, while the lowest level of BPI is in the field of auxiliary financial services. Integrated business processes in inventory, finances and implemented CRM and ERP systems are possible capabilities responsible for differences in business performance measured by profit and return on equity.

The quantitative part dealt with indirect indicators and showed differences between four industry branches and four size categories of enterprises in 2014 in the Czech Republic. There are differences in ICT processes and other characteristics. The share of in-house and extremal SW development is similar in all branches.

The qualitative case study showed remarkably similar results just as in previous papers (Lacity and Willcocks, 2016). The RPA should not be seen only as simple automation but as a complex instrument offering a lot of advantages if it operates in a precise working and stable company environment.

The RPA policy implications are summarized in Figure 2. and Figure 1. Our suggestions are based on the development in the Czech financial sector where a lot of resources were aimed at the development of ICT capabilities including RPA. The RPA projects between 2015-2020 are going to be sources of knowledge that are going to be utilized in further development of competitive advantage in financial services. This knowledge is to some extent transferable to other service sectors of the national economy which can make the “hype-and-fear” phase shorter and company learning faster.

This study has many limitations given the fact that financial sector data are anonymized in ICT surveys. The measurement of the competitive advantage of ICT capabilities is only indirect. The return on investment of RPA projects can be measured only indirectly because the outputs of these projects are intertwined with other company processes. Our suggestion for further research is to assess the technical cost efficiency in the financial sector between early adopters of RPA and followers.

There are many methodological and readiness-related RPA challenges (Syed et al., 2020). Given the strong experience in RPA in Czech financial sector and expected knowledge spillovers, we suggest focusing also on the innovations caused by RPA on management structures in private and public sector and the behavior of their employees and clients.

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THE NEXUS BETWEEN AGRICULTURAL PRODUCTIVITY, OIL PRICES, ECONOMIC GROWTH, AND FINANCIAL DEVELOPMENT IN THE USA

Turgut Tursoy, Simbarashe Rabson Andrea

International University of Erbil, North Iraq
Head of the Department of Banking and Finance, Near East University, North Cyprus

Turgut Tursoy

Head of the Department of Banking and Finance
Near East University, North Cyprus, Corresponding author
E-mail: turgut.tursoy@neu.edu.tr

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ABSTRACT

Purpose. *The study aims to examine the nexus between agricultural productivity by connecting oil prices, economic growth, and financial development.*

Design/Methodology/Approach. *A newly formulated ARDL model was used to estimate an agricultural productivity nexus model using annual time-series data from 1962 to 2016. Innovation and additive structural break unit root tests were applied to determine the existence of unit roots, and the results reaffirmed that all the variables were stationary at first difference. The Chow Breakpoint test was applied to confirm a structural break in the year 2008 caused by the effects of the 2008 financial crisis.*

Findings and Implications. *The results depicted a long-run relationship linking agricultural productivity, oil prices, economic growth, financial development and a financial crisis. The results also showed that financial development and economic growth have positive effects on agricultural productivity. The empirical findings further suggested that an increase in oil prices and the prevalence of a financial crisis have severe adverse effects on agricultural productivity.*

Originality. *The study provides a novel viewpoint of agricultural productivity by connecting oil prices, economic growth, and financial stability and development. The study successfully demonstrated that the financial sector and oil price stability are pivotal for enhancing agricultural productivity initiatives. This study highlights the policy implications of the estimated results for policymakers seeking to boost agricultural productivity by addressing economic misfortunes induced by oil shocks and a financial crisis.*

1. INTRODUCTION

Agriculture used to be the centre of national and global decision making with organizations such as the United Nations and the World Food Programme underscoring the need to boost agricultural productivity (Garnett et al., 2013). This stemmed from ideas that asserted that agricultural productivity goes a long way towards alleviating poverty (Irz, Lin & Thirtle, 2001; Thirtle, Lin & Piesse, 2003). With more than 9 billion stricken in poverty and huge need of food, one cannot deny the need to promote agricultural productivity (Godfray et al., 2010). Onoja (2017) acknowledges that an effort to promote food security can be made possible by promoting agricultural productivity. On a large note, agricultural productivity is mainly engineered to foster economic growth and development and its importance in an economy still remains undoubtedly significant. It is highly believed that agricultural productivity is one of the critical strategies that can be used to attain Sustainable Development Goals (SDGs), (Bebbington & Unerman, 2018). Diao, Hazell, and Thurlow (2010) believe that agricultural productivity is tied to quite several macroeconomic indicators. like financial development, economic growth, and stability, which highlights the existence of a nexus linking agricultural productivity, economic growth, and financial development. The oil industry is one of the most lucrative economic industries an economy can have, and economies such as the United States of America (USA) have gained a lot from oil production. It is estimated that revenue oil resulted in a surge in the USA's gross domestic product by 10% in 2018 (Journal of Petroleum, 2019).

Although the literature is relatively vast so far, to the best of our knowledge, no study has attempted to examine how financial development and economic growth coupled with commodity market (oil prices) and financial sector stability interact to boost agricultural productivity. With this backdrop, the study contributes in three different angles:

- 1 We assert that the combined effects of oil price and financial sector stability are vital for enhancing agricultural productivity, and this is the crucial point upon which we formulated a new Autoregressive Distributed Lag (ARDL) model.
- 2 Although there is a wide variety of research examining the linkage between financial development, financial sector stability, and agricultural productivity in advanced countries, far less is known about this relationship in the USA.
- 3 To our knowledge, this is the first study that combines these two different approaches to examine the nexus between agricultural productivity by connecting oil prices, economic growth, and financial development.

2. LITERATURE REVIEW

2.1. Theoretical background - the high payoff input model

The study applied the high payoff input theoretical model to examine the nexus between agricultural productivity by connecting oil prices, economic growth, and financial development. The high payoff input theoretical model offers an insight into the micro and macroeconomic factors required to boost agricultural productivity (Yaron, Voet & Dinar, 1992). The microeconomic aspects of the theory seek to improve labour productivity, while the macroeconomic aspects relate to efforts to provide high-payoff technology and other inputs. Thus, this theory shows that improvements in agricultural productivity are not solely based on microeconomic factors such as labour and capital. Nevertheless, instead of other external players and institutions' existence, financial institutions provide farmers with funds to acquire high-payoff technology (Udemezue & Osegbue, 2018). Efforts to understand how such a theory explains the nexus between agricultural productivity, oil prices, economic growth, and financial development is achievable by looking at the model assumptions.

Ruttan (1998) postulates that the high payoff input model is based on the assumption that economic growth is influenced by the availability and affordability of high-payoff technology. It also assumes that financial investments in the agriculture sector are affected by the ability of farmers to allocate and use resources effectively. The first assumption illustrates an interaction between economic growth and financial development, in the sense that the financial sector provides farmers with loans that they use to acquire high-payoff technology. Therefore, a positive association exists between economic growth and financial development. Udemezue and Osegbue (2018) acknowledge that this assumption helps explain why there exist differences in economic growth between developing countries and well-developed economies such as the USA. That is, it contends that developing countries do not have access to high-payoff technology. As such, their ability to attain a high level of economic growth depends on their potency to acquire high-payoff technology. Contrarily, the USA, which has a high availability of high-payoff technology, explains why its agriculture sector productivity and growth levels are high, traceable to the viability, growth, and development of their respective financial sectors. It is implying that high growth economies have high agricultural productivity levels due to having well-developed financial sectors.

It is also imperative to note that much of the high-payoff technology used in the agriculture sector relies on the use of petroleum products as a source of energy (Ruttan, 1998). Oil shocks will impose severe adverse effects on the agriculture sector. Binuomote and Odeniyi (2013) concurred with the idea and established that the same happened in Nigeria. If oil prices increase to a severe and unstainable level,

they may trigger a financial crisis in the form of an oil bubble (Sornette, Woodard, & Zhou, 2009). Stability in the financial and commodity markets is essential for a sound improvement in agricultural productivity.

The second assumption illustrates that investments in the agriculture sector are determined by the effective and efficient use of resources in the agriculture sector. Thus, effective and efficient resources are indicators that investors can utilize to make investment decisions, which also translates to a decline in non-performing loans allocated to the agriculture sector by the financial sector (Louzis, Vouldis, & Metaxas, 2012). Besides, an increase in agricultural productivity improves the ability of farmers to repay their agriculture loans leading to a decline in non-performing loans. Alternatively, banks can be said to benefit profit-wise from an improvement in agricultural productivity.

The major challenge with this theoretical aspect is that it does not offer sound explanations about the roles played by educational and research institutions. However, this theory is a close reflection of real economic situations because it acknowledges the importance and role of the government in influencing economic activities. The high payoff input theoretical model also emphasizes the importance of maintaining stability in financial and commodity markets and the economy at large. It highlights that economic growth strategies targeted at improving agricultural productivity through the effective and efficient use of resources have positive implications for financial development. However, such relies on financial, commodity markets, and economic stability and shows a nexus between agriculture growth, economic and financial stability, and macroeconomic variables.

2.2. Empirical literature review

The integration of oil prices in the context of agricultural productivity is a long-forgotten cause and an advancing phenomenon that this contemporary study addresses by examining related empirical voids. Besides, the driving factors of agricultural productivity are much restricted to factors like financial development (Zakaria, Jun & Khan, 2019), economic development (Schmidt, Jensen & Naz, 2018) and agricultural input subsidies (Simtowe & De Groote, 2021).

The examination of factors driving agricultural productivity is still gaining momentum in academic research. As such, it remains an exciting query to note that agricultural input costs, financial development, and economic stability and performance, are integral components driving agricultural productivity. Our suggestion is congruent with Liu and others (2020) suggestions denoting that changes in agricultural productivity are intertwined with several geographic-related, input-specific and country-specific factors. Thus, it becomes apparent that agricultural productivity strategies revolve around oil prices, financial development, financial stability (absence of financial crisis), and economic growth. However, connections between

some of these variables are contemporary and were still yet to be originally analysed in the context of the USA. Hence, they command academic researchers' attention.

Though it is quite prevalent in some studies that agricultural productivity is best enhanced in a thriving economy (Liu et al., 2020) in which farmers can easily and cost-effectively access funding from financial institutions (Fowowe, 2020), the stability of both the financial sector and economy are still yet to be considered. This concurs with related suggestions depicting that stability is vital for the effective and efficient functioning of institutions and economies worldwide (Abaidoo, Agyapong, & Boateng, 2021; Memeti & Memeti, 2021; Stubbs et al., 2021). Besides, previous qualitative analysis by Banett (2000) on the impact of the financial crisis on agriculture demonstrates that the financial crisis has ripple short-term and long-term effects on an economy and that much of the effects are also observable in the agriculture sector. Besides, the findings showed that equilibrium in agriculture markets does not remain stable during a financial crisis. Thus, this study's novelty will also be embedded in its efforts to establish and test both the short-term and long-term connection between these variables.

Amone (2014) did a study that focused on proving that agricultural productivity has effects on quite several macroeconomic indicators. As a result, Amone established that agricultural productivity causes positive changes in employment, food security, poverty alleviation, economic growth, and human development. This provides the support that improvements in agricultural productivity will help to stir economic growth and development. Hence, we can expect a similar effect in the USA. The results also revealed that the relationship between agricultural productivity and economic growth is a two-way relationship. This implies that efforts to promote economic growth will also cause an increase in agricultural productivity. Ismail and Kabuga (2016) also concurred with the same notion. However, they highlighted that positive developments in the labour and agriculture markets would lead to an increase in economic growth. This suggests the importance of the need to instil institutional stability in the economy. However, the arguments of our study are based on the need to prove that economic growth can also cause an increase in agricultural productivity.

Dhrifi (2014) focused on examining the effects of financial development on agriculture in 44 African countries using a GMM panel data estimation approach. Dhrifi argues that the effects of financial development on agriculture vary with the continent. As such, the results illustrated that financial development has no positive implications on agricultural productivity in African countries. Financial development is more likely to have positive implications for agriculture in the USA and this is because the USA has a well-developed financial sector that is capable of providing the agriculture sector with the required funds and services at affordable rates. The study also contends that the effective functioning of financial institutions is of paramount importance to the growth and productivity of the agriculture sector. Any form of in-

stability like a financial crisis and oil shocks can hinder financial development will hinder agricultural productivity and economic growth. In another study by Rizwan-ul-Hassan (2017), it was illustrated that the interaction between agriculture growth and financial development requires positive changes in financial access, capital, and labour. These results, therefore, provide strong evidence of the essential role of financial development in stirring agricultural productivity.

The present study has enhanced related literature by incorporating oil prices, financial development, financial stability (absence of financial crisis), and economic growth connection and their combined effects in circumstances where agricultural productivity varies distinctly. Thus, we provide in the next section the methodological procedures that were applied in analysing such connections in the next section.

3. METHODOLOGY

In this section, we briefly review the general framework for examining the nexus between agricultural productivity, oil prices, economic growth, and financial development. Firstly, we provide details of how the study's empirical model was developed. An Autoregressive Distributed Lag (ARDL) model was used for this study because an ARDL model can significantly yield consistent and efficient estimators (Pesaran & Shin, 1998). Godfrey (1978) also acknowledges that an ARDL model works the best when variables are integrated of different orders. That is when the variables have mixed stationarities in which some variables are stationary at a level while others are stationary at first difference. At this stage, we can posit that positive changes in agricultural productivity require a well-functioning economy that is free from the effects of a financial crisis and a developed financial system. This can mathematically be expressed in a functional form as follows;

$$AP = F [OP, EG, FD, FC] \quad (1)$$

where AP denotes changes in agricultural productivity, OP represents variations in oil prices, EG provides an indication of changes in economic performance as measured by gross domestic product (GDP), FD shows the economy's level of financial development and the dummy variable FC caters for structural breaks caused by the prevalence of a financial crisis. The variables were converted to logarithms to remove the skewness of the data and normalise it.

By including a constant α , regression analysis coefficients ($\beta_1 - \beta_n$) and error term (μ) to equation (1), the resultant expression is a regression model as expressed by equation (2).

$$LAP = \alpha + \beta_1 LOP + \beta_2 LEG + \beta_3 LFD + \beta_4 DVFC + \mu \quad (2)$$

The ARDL model was thus developed based on the model expression depicted by equation (2). The long-run ARDL model was therefore specified as follows:

$$LAP_t = a_0 + b_1 LOP + b_2 LEG + a_3 LFD + DVFC_t + e_{1t} LAP + c_{1t} LOP(-1) + d_{1t} LEG(-1) + e_{1t} LFD(-1) + f_{1t} DVFC(-1) \quad (3)$$

Secondly, the study proceeded to employ a long-run bounds test to determine the existence of a long-run interaction between the model variables. The bounds test works under the proposition of a null hypothesis that variables are not cointegrated in the long run (Pesaran, Shin & Smith, 2001) or simply that there exists no joint significance (Frimpong & Oteng-Abayie, 2006). That is:

- $H_N: a_1 = a_2 = a_3 = a_4 = 0$
- $H_A: a_1 \neq a_2 \neq a_3 \neq a_4 \neq 0$

Long run cointegration is established when the computed F-statistic lies beyond both the lower and upper bounds values leading to the rejection of H_N and acceptance of H_A . Computations of the bounds test are based on the inclusion of an error correction term (ECT), (Engle & Granger, 1987). The importance of an ECT is attached to its ability to offer insights into the model's speed of adjustment. Given regressors and X and R , and a regressand Y , the ECT can be computed as follows:

$$ECT_t - 1 = [YT - 1 - \eta Xt - 1 - \xi Rt - 1] \quad (4)$$

Based on the computed ARDL model that was utilized in this study, the error correction model was specified as follows:

$$\Delta LAP_t = a_0 + \sum_{i=1}^p a_{1i} \Delta LAP_{t-i} + \sum_{i=1}^p a_{2i} \Delta LOP_{t-i} + \sum_{i=1}^p a_{3i} \Delta LEG_{t-i} + \sum_{i=1}^p a_{4i} \Delta LFD_{t-i} + \sum_{i=1}^p a_{5i} \Delta DVFC_{t-i} + e_{1t} + d(LAP(-1)) + c(LAP(-1)) + d(LOP(-1)) + d(LEG(-1)) + d(DVFC(-1)) + ECT(-1) \quad (5)$$

Thirdly, we employed sensitivity analysis to test the robustness of our using the Ramsey Reset test to determine whether the variables have an element of non-linearity, Arch and Breusch-Godfrey-Pagan heteroscedasticity tests to ascertain if the agricultural productivity nexus model had heteroscedasticity problems. Furthermore, the Breusch-Pagan-Serial Correlation LM test was used to test for serial correlation at 0.05% while the Jarque-Bera test statistic was used to determine whether the variables were normally distributed over the period 1962-2016.

Lastly, we applied Cusum and Cusum of squares tests to determine if the estimated model is capable of offering useful policy-making suggestions (Ploberger & Krämer, 1990). Table 1. provides details of the model variables, unit of measure and data period used in this study.

Table 1.: Model variables, unit of measure and data period

Variable	Variable proxy	Unit of measurement	Period
Agriculture productivity	Agricultural imports	%	1962-2016
Oil prices	Average annual OPEC crude oil price from 1960 to 2018	US\$ per barrel	1962-2016
Financial development	Domestic credit to the financial sector	% of GDP	1962-2016
Economic growth	GDP	Annual % change	1962-2016
Financial crisis	Dummy variable	Categorical (0=no financial crisis, 1=presence of a financial crisis)	1962-2016

Source: Authors.

4. RESULTS

4.1. Unit root tests

Unit root tests were conducted to determine if innovation and additive outlier breaks influence the variables' order of integration. Based on the computed innovation-outlier unit root results (Table 2.), we can establish that LAP and LOP are stationary at first differences while LEG and LFD are stationary at level.

Table 2.: Innovation structural break unit root test

Variable	Level	Prob.	1 st difference	Prob.	Decision
LAP	-3.35	0.78	-7.06	<0.01	I(1)
LOP	-3.19	0.93	-7.27	<0.01	I(1)
LEG	-12.99	<0.01	-16.44	<0.01	I(0)
LFD	-5.75	<0.01	-5.36	0.0307	I(0)

Source: Authors.

The results entail that the 2008 financial crisis (structural break) did not influence the variables' order of integration. Consequently, we can infer that the variables do not have unit roots illustrating that the results will not be spurious (Madala, 2001). The innovation-outlier break type test results shown in Table 3. confirmed that all

the variables are stationary at first difference. These results entail that the variables have similar integration orders, which were not affected by the 2008 structural break did not influence the variables' order of integration. Accordingly, that makes it feasible to estimate an ARDL model, and thus, the researchers proceeded to estimate an ARDL model.

Table 3.: Additive structural break unit root test

Variable	Level	Prob.	1 st difference	Prob.	Decision
LAP	-3.53	0.80	-7.56	<0.01	I(I)
LOP	-3.25	0.91	-7.60	<0.01	I(I)
LEG	-6.71	<0.01	-11.17	<0.01	I(o)
LFD	-5.67	0.01	-5.54	0.02	I(o)

Source: Authors.

4.2. Structural break test

The reliability and sufficient forecasting capability of a model such as an ARDL model require that such structural breaks be catered for. Hence, it is always essential to include a dummy variable when estimating the ARDL model. In this study, the notable structural break observed in the USA during the concerned period under study (1962–2016) is the 2008 financial crisis. Concerning this study, the 2008 financial crisis had severe effects on many macroeconomic indicators and commodity prices such as oil prices. The US's economic growth, financial development, and GDP fell to as low as -0.83% in 2008, while the banking sector succumbed to bank runs (Multpl, 2018)¹. Hence, the Chow Breakpoint test was applied to confirm a structural break in the year 2008, and the established results are depicted in Table 4.

Table 4.: Chow Breakpoint test

F-stat.	3.67	Prob. F(5,45)	0.01
Log L.R.	18.81	Prob. Chi-square (5)	0.00
Wald stat.	18.35	Prob. Chi-square (5)	0.00

Source: Authors.

Using the depicted breakpoint test results, we can affirm that there was a structural break in 2008. Such reinforces the 2008 financial crisis's influence on agricultural productivity, oil prices, financial development, and economic growth. Hence, a dummy variable (DVFC) was incorporated into the model estimation to capture the prevalence of the financial crisis.

¹ Since the study relied on using secondary data, we made an assumption that the financial crisis experienced in the USA ensued in 2008 and dissipated in the same year, and this affects structural breaks.

4.3. ARDL Bounds test

The study adopted the bounds test to strive to establish if agricultural productivity, oil prices, economic growth, and financial development are cointegrated in the long run. The obtained significant F-statistic lies above both the lower and upper bounds values. Hence, we concluded that the model variables are cointegrated in the long run.

Table 5.: ARDL Cointegration Test

Significance level									
F-Statistic	1%		2.5%		5%		10%		DW
	L _B	U _B	L _B	U _B	L _B	L _B	L _B	U _B	
9.488540 k=4	3.29	4.37	2.88	3.87	2.56	3.49	2.20	3.09	2.24
R ² = 0.77 Adj. R ² = 0.64									
Prob. F stat. = 0.00									

Source: Authors.

An R-square value of 0.77 was obtained and this implied that 77.21% of the observed variations in agricultural productivity were explained by LOP, LFD, LEG and FC (see Table 5.).

4.4. Short-run bounds test results

The depicted results denote that previous levels of agricultural productivity influence proceeding levels of agricultural productivity. This is because agricultural productivity remained in an unfavourable state at lags 1, 2, and 3 with respective values of -0.12, -0.31, and -0.29. The results also show a series of short-run volatile changes in oil prices between the period 1962 to 2016, as evidenced by a decline in oil prices from a positive effect of 0.01 to an adverse effect of 0.01 in the first lag. The effect later increased from an adverse effect of -0.12 to a positive effect of 0.07 in the second lag.

In the short run, GDP can be observed to have been significantly falling at both the first lag and second lag, suggesting a decline in economic performance triggering adverse effects in other sectors through contagion effects, which can affect agricultural productivity. The period 1962 to 2016 was linked to substantial improvements in agricultural productivity caused by positive developments in the USA's financial sector. The extent to which financial development contributed towards improving agricultural productivity went up from -1.25 to 0.63 in the first lag. Also, the capacity of financial development to increase and contribute positively towards agricultural productivity went down in the second lag.

Table 6.: Short-run bounds test estimations

Variable	Coefficient	Std. Error	t-statistic	Prob.
D(LAM(-1))	-0.12	0.11	-1.15	0.26
D(LAM(-2))	-0.31	0.09	-3.56	0.00
D(LAM(-3))	-0.29	0.08	-3.91	0.00
D(LOP)	0.00	0.02	0.08	0.94
D(LOP(-1))	-0.01	0.02	-0.52	0.61
D(LOP(-2))	0.07	0.02	3.01	0.01
D(LEG)	0.03	0.01	3.03	0.00
D(LEG(-1))	-0.03	0.01	-1.85	0.07
D(LEG(-2))	-0.05	0.01	-4.04	0.00
D(LFD)	-1.25	0.27	-4.66	0.00
D(LFD(-1))	0.63	0.38	1.65	0.11
D(LFD(-2))	-1.32	0.34	-3.84	0.00
D(LFD(-3))	0.47	0.27	-1.76	0.09
C	-1.44	0.62	-2.31	0.03
Coint EqT (-1)	-0.15	0.02	-8.11	0.00*
R ² = 0.89				
Adj. R ² = 0.81				
Prob. F stat. =				
0.00 DW.				
Stat. = 2.25				

Source: Authors.

Table 6. results show that the cointegration term is negative and significant at 1% signifying the existence of cointegration in the short run between AP, OP, EG, FD, and FC. The related cointegration value of 0.15 implies that the previous years' deviations from long-run equilibrium are corrected in the same year at a speed of 15%.

4.5. Long-run bounds test

Table 7. long-run bounds test results show that financial development and agricultural productivity are unilaterally linked by 2.27, suggesting that an improvement in financial development by 1 unit will initiate favourable variations in agricultural productivity by 2.27 units. The results align with Rizwan-ul-Hassan's (2017) results, asserting that this results from the financial sector's capacity to finance the acquisition of high-payoff agricultural technology. Our findings of a positive relationship

between economic growth and agricultural productivity of 0.48 units are consistent with Amone (2014) and Ismail and Kabuga (2016). These studies highlighted that economic growth's positive effects on agricultural productivity result from the enactment of growth strategies, agricultural policies, and institutional stability measures.

Table 7.: Long run bounds test

Variable	Coefficient	Std. Error	t-statistic	Prob.
Financial Development	2.27	1.05	2.17	0.04**
Economic Growth	0.48	0.12	3.95	0.00*
Oil Prices	-0.20	0.07	-2.94	0.01*
Financial Crisis	-0.64	0.18	-3.50	0.00*
C	-9.46	4.39	-2.16	0.04**
$R^2 = 0.77$ $Adj. R^2 = 0.64$ Prob. F stat. = 0.00 DW. Stat. = 2.24 * and ** = $p < 0.01$ and $p < 0.05$ respectively				

Source: Authors.

The obtained results denote and reinforce the idea that a surge in oil prices has severe adverse effects on agricultural productivity, as noted by a negative coefficient of 0.20 (see Table 7.). Wang and McPhail (2014) acknowledged this and hinted that it is a considerable challenge for the agriculture sector to thrive when oil prices surge up high, as implied by the high payoff input.

Table 7. results also support ideas deduced from the high payoff input model, suggesting that economic disturbances like the financial crisis hinder agricultural productivity as an increase in the financial crisis by 1-unit results in a decline in agricultural productivity by 0.64 units. Deepak (2012) also accepted this idea and outlined that farmers usually fail to access the required capital funding during a financial crisis. As such, agricultural productivity tends to decline during a period characterised by incidences of a financial crisis.

The obtained long-run R-square value of 0.77 suggests that 77.21% of the variations in agricultural productivity are explained by changes in agricultural productivity, oil prices, economic growth, financial crisis, and financial development. Thus, 22.79% of the changes in agricultural productivity are attributed to changes in other variables outside the estimated model.

4.6. Sensitivity analysis, and stability tests

Ramsey Reset test by Ramsey and Schmidt (1976), was employed to determine whether the variables have an element of non-linearity or not. In light of the reported Ramsey Reset test findings, conclusions can be made that the ARDL model has no non-linearity features ($\chi^2=0.39$; $p=0.54$). Sensitivity analysis was also undertaken concerning normality, heteroscedasticity (arch, Breusch-Pagan-Godfrey) and serial correlation tests (see Table 8.). Respective p-values of 0.97, 0.82, 1.0.0 and 0.08 were recorded and this purports that the variables are normally distributed and that heteroscedasticity and serial correlation problems are not evident.

Having a redundant variable test F-statistic value of 14.34 with an associated p-value of 0.00 implies that the null hypotheses of no joint insignificance between LOP, LFD, LEG and FC (H_0 : LOP, LFD, LEG and FC are not jointly insignificant) can be rejected at 5 % ($p<0.05$). The results thus, provide strong evidence that OP, FD, EG and FC are jointly significant in explaining possible variations in agricultural productivity in the USA (see Table 8.).

Table 8.: Sensitivity analysis²

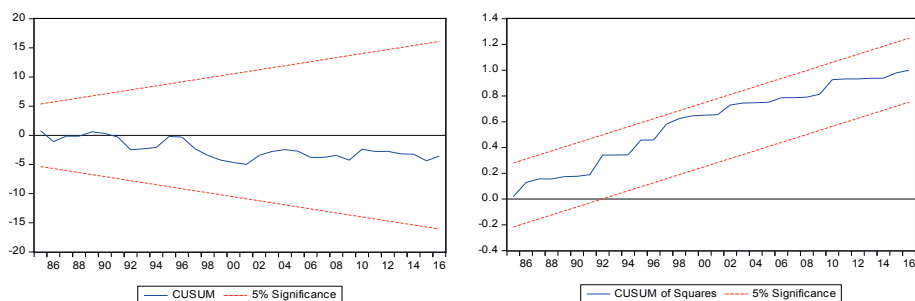
	χ^{2N}	χ^{2AR}	χ^{2BR}	χ^{2SC}
	0.39 (0.54)	0.06 (0.97)	0.05 (0.82)	0.51 (1.00)
				1.67 (0.08)
Redundant test on LOP, LFD, LEG and DVFC				
		Value	Df	Prob.
F-statistic		14.34	(4, 32)	0.00

Source: Authors.

Cusum and Cusum of squares stability inquiries were employed to ascertain if the formulated model can be declared to be stable throughout the study which has been established to be 1960 to 2016. Based on Figure 1. presentation, it can be heeded that the model confines within the critical bounds. Hence, inferences are established that the formulated ARDL model is stable over the period 1960-2016.

2 RR, χ^{2N} , χ^{2BR} , χ^{2AR} and χ^{2SC} Ramsey Reset Test, langrage multiplier for normality, Arch test for heteroscedasticity at lag 1, Breusch-Godfrey-Pagan test for heteroscedasticity and serial correlation at 2 lags. The values in parenthesis are the corresponding P-Value. As a result, it can thus be concluded that that the estimated model does meet the necessary sensitivity standards and can be safely used for policymaking.

Figure 1. : Cusum stability inquiries (Researchers, 2021)

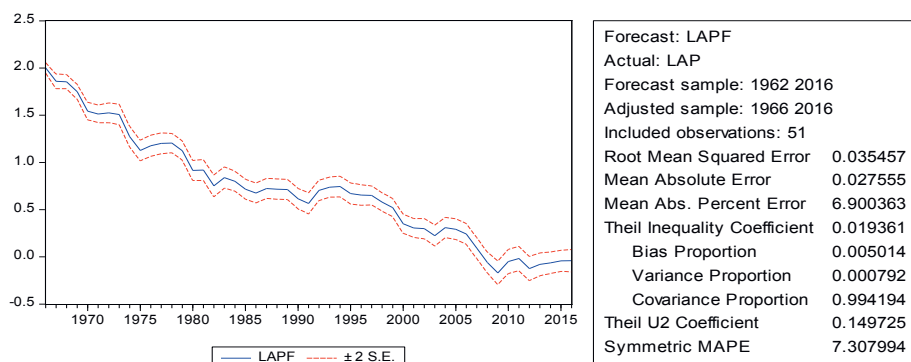


Source: Authors.

4.7. Model performance and forecast error diagnosis

Model performance and forecast error diagnosis were also undertaken to determine whether the predictive power of the computed ARDL model is satisfactory and free from biases. This was accomplished using a dynamic forecasting technique. The reason behind the use of a dynamic forecasting model is justified by the fact that it accounts for time-dependent changes or events (Evensen, 1994). This is of paramount importance, especially when considering the effect of structural breaks and seasonal changes that impose effects on economic variables.

Figure 2.: Model performance and forecast error diagnosis



Source: Authors.

The Theil inequality of 0.0019 is almost 0 and this implies that there is a perfect fit as it is associated with a very low bias proportion or systematic error of 0.5% (Figure 2.). The root mean square is very low and stands at 0.04 and this indicates that the forecasting model is in a good position to offer reliable estimates for policy formulation and decision making. The estimated agricultural productivity nexus model

is thus a useful tool and ought to be used to formulate economic policies at both national and global levels.

4.8. Effects of financial development on agricultural productivity

One of the fundamental aspects of econometrics states that an effect between variables does not always imply that it causes possible changes in each other (Gujarat, 2012). Accordingly, Granger (1988) proposes that causality tests be done to establish the existence of causality between the variables. The established long-run bounds test results confirmed a positive linkage between financial market developments and agricultural productivity. However, it remained proven if financial development stirs up a surge in agricultural productivity or if agricultural productivity causes financial development. It is in this regard that the Granger causality test was applied.

Table 9.: Pairwise Granger causality test

AP			OP		FD		EG		FC	
	χ^2	prob.	χ^2	prob.	χ^2	prob.	χ^2	prob.	χ^2	prob.
AP	-	-	2.56	0.09	0.59	0.56	4.69	0.01	0.16	0.85
OP	6.25	0.00	-	-	1.27	0.29	2.86	0.07	5.50	0.01
FD	0.49	0.61	0.36	0.70	-	-	3.05	0.06	0.03	0.97
EG	2.04	0.14	0.32	0.73	7.12	0.00	-	-	1.86	0.17
FC	4.87	0.01	0.37	0.69	0.56	0.57	1.24	0.30	-	-

Source: Authors.

Table 9. results indicate that during the period 1962 to 2016, financial development did not Granger cause an increase in agricultural productivity. Alternatively, agricultural productivity did not also Granger cause financial development, an increase in oil prices, and economic growth during the same period. Similar effects were observed regarding economic growth, while the financial crisis granger caused an increase in oil prices between 1962 to 2016.

5. CONCLUSIONS

The study examined a nexus linking agricultural productivity, oil prices, economic growth, and financial development. Such an interaction works towards improving agricultural productivity but can be impaired by oil shocks and financial crises. The computed Bounds test proved a nexus linking agricultural productivity, oil prices, economic growth, and financial development in both the short run and long run. Our results support the view that positive economic and financial sector developments are vital for enhancing agricultural productivity. When imposing a linear relationship, the results suggest that the 2008 financial crisis and economic growth

are negatively related in the long run. We found evidence showing that the impact of economic growth on agricultural productivity can be undermined by rising or volatile oil prices undermine agricultural productivity as oil is a significant energy source in the agriculture sector. Several studies agree with this notion and establish that reducing factor input costs is pivotal in improving agricultural productivity.

The study's theoretical implications suggest that it is imperative for the financial sector to effectively supply farmers with the required funds to aid them in securing agricultural productivity-enhancing high payoff input technology needed to produce more agricultural produce at a relatively low cost. The study practically demonstrated that agricultural productivity and economic growth are positively related. Such a notion is considered authentic by a significant number of studies that strongly argue that economic growth and development policies inevitably work towards improving agricultural productivity on the condition that the effects of oil shocks and financial crises are minimised and stability instilled in all markets.

We believe that our results are of potential importance to policymakers in terms of financial institutions developing measures to curb the effects of a financial crisis by adopting recapitalisation and risk management strategies, and availing of new financing programs (microloans and direct operating loans), financial mechanisms and instruments (aggie bonds) to the agriculture sector. Policymakers should seek to introduce economic policies that boost economic growth and development and favour financial development. Besides, the policy implications demand the government to support the effective use of the agriculture policy by promoting institutional stability (establish safety nets to cushion against the effects of a financial crisis), creating a conducive environment in which the agriculture sector can thrive, introducing agricultural development programs and providing subsidies to farmers.

The study's knowledge judgments are limited to the USA and restrict how they can be generalised and applied in other countries. More so, oil shocks and the 2008 financial crisis affected many countries. Future studies must conduct a comparative analysis of the affected countries to enhance the study's coverage. For some future research, a pandemic crisis should be considered as well as its impact on the observed variables.

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