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The Impact of Contingency Factors on the Sophistication of Costing Systems: Evidence from Tunisia

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Abstract

This research investigates the impact of contingency factors on the sophistication of costing systems in Tunisia. Sophistication is analyzed by using the following criteria: ABC systems, full costing systems, the number of cost pools in the first stage of allocation and the number of cost drivers in the second stage of allocation.

Data were collected through a questionnaire next to 68 companies having a costing system. Findings show that contingency factors affect the sophistication of costing systems and that company's strategy and product diversity are the most important factors. These two contingency factors are related to different dimensions of the sophistication. Moreover, big-sized companies and manufacturing companies are more likely to adopt ABC. In addition, the importance of cost information positively affects the use a full costing system and companies with high percentages of indirect costs have a greater number of cost pools.

This piece of research is one of the rare studies dealing with the characteristics of costing systems. Previous research dealt basically with ABC and are mainly conducted in developed countries. This study adds to knowledge since it is conducted in a developing country and investigates the sophistication of costing systems.

Keywords: sophistication of costing system, contingency factors, ABC systems, full costing systems, number of cost pools, and cost drivers.

I. INTRODUCTION

Previous research has investigated the influence of contextual and environmental factors on the adoption and non-adoption of ABC (Jones & Dugdale, 2002). Based on the contingency theory, this study highlights the impact of contingency factors on the sophistication of costing systems in Tunisia.

The traditional costing systems were important to the organizations' success and useful for the management process. However, since the end of the eighties, they have been the subject of a great debate. Several criticisms have been made to the traditional costing systems, which are considered to be outdated and unable to respond to the current changes of the companies' characteristics and environments (Hofmann & Bosshard, 2017). Some researchers have shown that these systems are no longer able to provide a good measure of performance (Johnson & Kaplan, 1987; Goldratt & Cox, 1992). Furthermore, information on product costing is distorted and can lead to inappropriate decisions and consequently to the loss of competitive advantages (Cooper & Kaplan, 1988). As a result, more sophisticated designs of costing systems had been proposed. The aim was to provide a more detailed and reliable costing information.

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These techniques are based on the activity-based costing method (ABC) which is developed by Johnson and Kaplan (1987).

The relationship between ABC and the contingency factors has been the subject of several studies showing that only a few factors are related to the adoption of ABC (e.g. Bjornenak, 1997; Malmi, 1997). In addition, low rates of adoption were found in many countries. Moreover, contradictory results were highlighted in accordance with the context of the study. As a result, some researchers do not limit their investigations to ABC, but rather focus on the characteristics of costing systems and their sophistication (e.g. Al-Omiri & Drury, 2007). Researchers have questioned the usefulness of ABC in providing more accurate costs (e.g. Maher & Marais, 1998; Gupta & Galloway, 2003). Moreover, the findings of some previous studies highlighted various costing management practices which are based on ABC systems (Gosselin & Mevellec, 2003). The article of the Abernethy et al. (2001) is perhaps the first published paper that dealt with the characteristics of costing systems. Later, a study conducted by Drury and Tayles (2005) and Al-Omiri and Drury (2007) investigated the relationship between contingency factors and the sophistication of costing systems in the UK. It highlighted the usefulness of research on the characteristics of costing systems and especially, on the sophistication of costing systems. The Tunisian context is different from that of developed countries (e.g. UK), since its economy is mainly based on SMEs companies. In addition, this country was under the French protectorate and thus, management accounting systems are largely influenced by the French methods. Therefore, it is important to study the sophistication of costing systems in this country and the influence of contingency factors on the characteristics of these systems. The aim of this research is to investigate the influence of contingency factors on the sophistication of costing systems in Tunisia.

The factors analyzed are the importance of cost information, product diversity, cost structure, competitiveness of the environment, size of organization and strategy. We used a questionnaire next to 68 Tunisian companies. The mains results highlight the influence of the contingency factors and especially company's strategy and product diversity on the sophistications of costing systems.

This piece of research adds to knowledge since previous studies are either interested in the sophistication of costing systems in developed countries (e.g. UK) or in ABC, either in developed or in developing countries (e.g. Al-Omiri & Drury, 2007; Rundora et al., 2013). It was conducted in order to overcome these limitations and investigate the sophistication of costing systems in a developing country. This work can be useful for managers who have to choose the suitable costing system that can help them for a better decision making.

The rest of this paper is divided as follows: in the second paragraph, we expose the conceptual framework, the third paragraph presents the literature review and develops hypotheses, the fourth paragraph exposes the design of research and the fifth paragraph presents and analyzes results before concluding in the last paragraph.

II. LITERATURE REVIEW

Drury and Tayles (2005), Al-Omiri and Drury (2007) and Abdel-Kader and Luther (2008) investigated the characteristics of costing systems and did not limit their studies to ABC. Al-Sayed and Dugdale (2016) were interested in the activity-based innovations, while Nguyen et al. (2019) studied the development of managerial accounting in Vietnam. Furthermore, Nimtrakoon and Tayles (2015) analyzed the relationship between a set of forty-three management accounting practices (i.e. classified as traditional or contemporary management accounting practices) and the contingency factors that are

related to strategic typologies in Thailand. Al-Omiri and Drury (2007) conducted a study on the relationship between the sophistication of costing systems and some contingency factors in the UK. These factors are the importance of cost information, product diversity, cost structure, intensity of the competitive environment, company's size, quality of information technology, the extent of use of new management accounting techniques, the extent of use of developed production techniques (such as JIT) and industry. Based on previous research and on the Tunisian context, we analyze the following contingency factors: Importance of cost information, product diversity, cost structure, competitiveness of the environment, size and strategy.

Enviroment and size are key contingent factors in the literature of management accounting and are confirmed to be fundamental elements of the context (Chenhall, 2007). Strategy is considered as the most relevant contingency factor in the contemporary management accounting research (Chenhall, 2007). The importance of cost information is analyzed because the amount and scope of information needed can define the management accounting practices (Yalcin, 2012). Product diversity and cost structure are main factors justifying the need of developed accounting practices like ABC and thus, can affect the sophistication of costing systems. Factors related to advanced manufacturing production like total quality management and just in time were not analyzed because these advanced technologies are not available in Tunisia.

2.1. Conceptual Framework

2.1.1. Contingency Theory

Contingency theory has long been the basic theoretical framework upon which a large body of management accounting research has been based (Hall, 2016; Granlund & Lukka, 2017). Our study is based on the contingency theory which is a response to the universal model supporting the "one best way" and the universality of good practices. According to Nimtrakoon and Tayles (2015), the management accounting practices adopted depend on the companies' specific context and environment. The contingency theory is based on the fit between the companies' management accounting characteristics and contingency factors (Nimtrakoon & Tayles, 2015). It can explain the various management accounting practices used (Nimtrakoon & Tayles, 2015). Chenhall (2003, 2007) analyzed the empirical studies which are based on this theory.

The contingency theory can explain the effect of the organizational and environmental factors on the characteristics and the sophistication of costing systems (Donaldson, 1996; Sartorius et al., 2007). In management accounting, the contingency theory is based on the assumption that there is no management accounting system that is universally appropriate for all organizations, regardless of their characteristics and environment (Otley, 1980, Shahzadi, 2018). Thus, the contingency theory makes it possible to identify the specific factors and circumstances that can be associated with a suitable costing system. In management accounting research, this theory has become one of the dominant paradigms of management control design research (Fisher, 1995; Otley, 2016).

Over the past three decades, contingency theorists have called for more research on the influence of contextual factors on the effective design of management accounting systems (e.g. Fisher, 1995; Chenhall, 2003).

Several contingency factors are assumed to affect the adoption of ABC. The factors analyzed differ among studies. Some of them have been widely investigated. However, the operational definition of the same factor is not the same for all studies which may explain the difference between their results.

2.1.2. Sophistication of Costing System

Previous research on costing systems has been based on a comparison between firms using traditional costing systems and those using ABC systems (e.g. Gosselin, 1997; Malmi, 1999). Abernethy et al. (2001) analyzed the characteristics of costing systems which are based on the types of cost pools. They distinguished between the cost pools used in the traditional costing system and the activities that are used in ABC systems. The concept of characteristics of costing systems was used by some researchers (e.g. Abernethy et al., 2001). Nguyen et al. (2019) investigated the development of managerial accounting in the case of the manufacturing and trade companies in Vietnam.

In a few published studies, researchers used the concept of "complexity of costing systems" (e.g. Drury & Tayles, 2005). Drury and Tayles (2005) defined the complexity level according to the number of cost pools and the number of cost drivers. The level of complexity increases in accordance with the number of cost pools and the number of cost drivers. An increase in the number of cost pools increases the ability of a costing system to capture the different resources consumed in the production process (Drury & Tayles, 2005).

According to Al-Omiri and Drury (2007), the costing system can be characterized by the four following dimensions: the number of cost pools, the number and type of cost drivers used in the second stage of allocation and the extent to which direct allocations are used in the first stage of allocation. Costing systems are ranked according to their level of sophistication on a continuum representing the four dimensions of indirect costs' allocation. High levels of sophistication are expected to be associated with the increase in the number of cost pools. A high number of cost pools allows the costing system to better capture the variability of resources' consumption. The second dimension influencing the level of sophistication is the number and types of cost drivers used in the second stage of allocation. The use of a wide range of cost drivers allows the establishment of a causal relationship between each cost pool and the resources consumed. A costing system with many cost pools and many cost drivers are more sophisticated than a costing system with a few cost pools and cost drivers. However, it is difficult to evaluate the degree of sophistication of a system based on many cost pools but on a few cost drivers (Al-Omiri & Drury, 2007). Therefore, the intermediate level of sophistication is difficult to assess. In this study, we adopt the dimensions used by Al-Omiri and Drury (2007) to measure the sophistication of costing systems.

2.1.3. Contingency Factors

The external and internal contingency factors affect management accounting systems (Ahmad & Zabri, 2015; Shahzadi et al., 2018). The study of Khandwalla (1972) is the first piece of research that investigated the role of "external environment" contingency factor in the area of management accounting. The intensity of competition was the only environmental factor used to study the design of costing systems. Drury and Tayles (2005) found in their literature analysis that cost structure, technology and size are the most commonly used contingency factors. Strategy is an important contingency factor (Nimtrakoon & Tayles, 2015). The "strategy" factor has also been analyzed in costing system studies (e.g. Gosselin, 1997). Wallace (2002) studied the contingency factors related to the intensity of competition, cost structure, technology, size, strategy, and top management support. Ahmed and Zabri (2015) investigated the effect of the intensity of market competition, technology, size and Commitment of owner/manager on the management accounting practices in Malaysian SME. Al-Omiri and Drury (2007) identified nine contextual factors influencing the sophistication of costing systems.

2.2. Hypotheses Development

2.2.1. Importance of Cost Information

A costing system has to provide information to manage the costs and mix of activities, products and services (Drury & Tayles, 2005). The lack of information for decision making is one of the main reasons for using ABC (Schoch et al., 1994). In fact, ABC is relevant and provides relevant information for decision making (Gosselin, 2007). In this context, Al-Omiri and Drury (2007) studied through a questionnaire next to 176 companies in the UK, the influence of contextual factors on the sophistication of costing systems. Their results showed that the importance of cost information positively affects the number of cost pools and the number of cost drivers. Organizations with a high-quality information system can provide detailed data, which facilitates the access to more sophisticated costing systems (Al-Omiri & Drury, 2007). In addition, Mia and Clarke (1999) argued that the management accounting system provides the required information to identify, evaluate and implement appropriate strategies. Furthermore, Nguyen et al. (2019) found that managers' information needs are one of the most important factors affecting the development of managerial accounting. In addition, according to Cinquini et al. (2013), the characteristics of costing systems are related to the potential of cost information to support managers in their decision making.

Although sophisticated costing systems can significantly reduce costing distortions, it is unlikely that a company can make an optimal use of cost information in the decision making process (Cagwin & Bouwman, 2002). Factors affecting the usefulness of cost information include the company's use of cost data in pricing decisions, cost reduction efforts, special cost studies, and strategic developments (Estrin et al., 1994; Al-Omiri & Drury, 2007). Hence, the following hypothesis is formulated:

H_1: the importance of cost information positively affects the sophistication of costing systems.

2.2.2. Product Diversity

Several studies have found a positive relationship between product diversity and either the adoption of ABC (e.g. Bjornenak, 1997; Malmi, 1999; Schoute, 2011; and Tsifora & Chatzoglou, 2016) or the use of developed managerial accounting systems (Nguyen et al., 2019). According to Malmi (1999), the production process and the type of costing systems are related. Product diversity creates the need for detailed and accurate costing systems (Tsifora & Chatzoglou, 2016). As a result, the complexity of the production process has an impact on the choice of costing systems. The more complex the production process, the more complex the costing system. Thus, to measure the resources consumption of various products in a complex arrangement, sophisticated costing systems are needed (Malmi, 1999). Bjornenak (1997) used the number of products and the degree of customization to test the product diversity. The results showed that ABC adopters have a higher number of products compared to non-adopters. In addition, non-adopters are more likely to produce customized products than adopters. Furthermore, ABC was adopted by companies producing a large number of semi-standardized products (Bjornenak, 1997).

Clarke et al. (1999) examined the adoption of ABC by industrial companies in Ireland. The results showed that firms producing more than five similar products tend to use ABC compared to firms with fewer products. In addition, the results of Brown et al. (2004) showed that product complexity and product diversity are positively and significantly associated with the implementation of ABC systems.

Al-Omiri and Drury (2007) argued that product diversity leads to a higher probability of cost distortion. A great diversity of products requires more sophisticated

costing systems to capture the variation in resources consumption by different products. Hence, the following hypothesis is formulated:

H_2: the product diversity positively affects the sophistication of costing systems.

2.2.3. Cost Structure

The cost structure is an important factor in assessing the relevance of a management accounting system. Johnson and Kaplan (1987) have argued that for several decades, there has been a great change in cost structure and consequently, firms need to change their costing systems. Similarly, Cooper (1988) claimed that overhead costs increased over time and especially in the 1980s. This increase in indirect costs distorts the simplistic systems based on the use of direct labor hours for allocating overheads. Moreover, Bjornenak (1997) showed that the cost structure, is significantly different between adopters and non-adopters of ABC in Norway. Also, Booth and Giacobbe (1998) found that the cost structure is significantly associated with the interest in adopting ABC.

Even if some studies found no relationship between cost structure and ABC (e.g. Van Nguyen & Brooks, 1997; Clarke et al., 1999), the increase in indirect costs was one of the main reasons for the development of ABC. Traditional costing systems based on an arbitrary allocation of overhead can no longer respond to the changes of the organizational context. Researchers have shown that ABC systems can more accurately measure the resources consumed (e.g. Drury, 2001). The cause-and-effect relationship provides a better choice of cost drivers and more accurate costs. In addition, ABC allows better allocation of fixed costs (Sartorius et al., 2007), mainly for companies producing various products that consume several resources (Baird et al., 2004).

According to Cooper and Kaplan (1998), companies with high proportion of indirect costs should allocate these costs using more sophisticated systems, since traditional systems are likely to cause distorted costs. Conversely, when the proportion of indirect costs is low, simplistic traditional systems may suffice because it is unlikely to lead to a highly distorted cost ratio (Drury & Tayles, 2005). Hence, the following hypothesis is formulated:

H_3: the percentage of indirect costs positively affects the sophistication of costing systems.

2.2.4. The Competitiveness of the Environment

In the dynamics of competition, competitive actions and reactions can be more or less threatening for a company (Chen et al., 1992). Bruns and Kaplan (1987); O'Connor et al. (2004); and Ahmad and Zabri (2015), argued that competition is an important and stimulating external factor that drives managers to remodel their costing systems. Firms facing more intense competition have to find ways to differentiate their products and services from those provided by competitors (Guilding & McManus, 2002). This results in a greater number of product lines and services and thus, requires a sophisticated costing system in order to accurately measure costs.

Khandwalla (1972) studied some competitive conditions in which sophisticated management control systems and management accounting systems are used. His results showed a positive relationship between competition and the use of sophisticated control systems. Furthermore, according to Al-Omiri and Drury (2007), firms facing intensive market conditions are likely to have products and services with low profit margins due to pressures from competing companies which seek to match or reduce prices. Thus, organizations facing intense competition have an increased need for accurate cost information.

According to Bjornenak (1997) and Cooper (1988), competition increases the errors caused by traditional systems and the competitors can benefit from the mistakes made. In addition, Simons (1990) and Libby and Waterhouse (1996) invited firms facing competitive market environments to use more sophisticated management accounting systems. Hence, the following hypothesis is formulated:

H_4: the competitiveness of the environment positively affects the level of sophistication of costing systems.

2.2.5. Size of Organization

Several studies have found a positive relationship between firm's size and the adoption of sophisticated costing systems (e.g. Malmi, 1999; Abdel-Kader & Luther, 2008; Cadez & Guilding, 2008; Albu & Albu, 2012; Ahmad & Zabri, 2015; Tsifora & Chatzoglou, 2016; and Nguyen et al., 2019). Firm's size has been found to be an important factor influencing the adoption of complex and sophisticated costing systems (Moores & Chenhall, 1994; Abdel-Kader & Luther, 2008). It is the most important factor that discriminates between adopters and non-adopters of ABC (Bjornenak, 1997). Large companies have more resources to adopt ABC (Groot, 1999). They also have better internal communication systems that promote the diffusion and adoption of innovations (Ahmad & Zabri, 2015). Furthermore, big-sized companies have generally complex activities and thus, need comprehensive and sophisticated management accounting systems in order to manage complexity (Ahmad & Zabri, 2015).

Most researchers (e.g. Van Nguyen & Brooks, 1997; Clarke et al., 1999; Abdel-Kader & Luther, 2008; and Ahmad & Zabri, 2015) argued that firm's size is an important factor in the adoption of a sophisticated costing system. Larger companies may have relatively easier access to resources to experiment with a more sophisticated costing system (Al-Omiri & Drury, 2007). As a result, the following hypothesis is developed:

H_5: the company's size positively affects the level of sophistication of costing systems.

2.2.6. Strategy

A company's strategy represents the objectives' choice and the means used to achieve them, after an assessment of their strengths and weaknesses, both internally and externally (Chandler, 1962; Miles & Snow, 1978). Nimtrakoon and Tayles (2015) focused on the relationship between strategy and management accounting practices in Thailand. Miles and Snow (1978) identified four types of strategies based on the propensity of strategic units to modify their products and the market in which they operate. This typology distinguishes between the four following strategic behaviors: "prospectors" which are companies that have an organic structure and struggle with innovation, "defenders" which are champions in their sectors and which have centralized structures and maintain their field of excellence through low costs, "analyzers" that are a hybrid of the two previous ones and finally "reactors" that, because of lack of vision, follow and copy but do not adapt their organization, and this behavior can lead them to failure. The main difference between organizations is their propensity for rapid organizational change. As a result, we adopted in this study the typology of Miles and Snow (1978).

Prospectors are organizations that are always looking for new market opportunities by developing and manufacturing new products in order to respond to the needs of their customers. Thus, they initiate changes in their sectors and face a higher level of contextual uncertainty (Slocum et al., 1985; Govindarajan, 1986). They invest significant amounts in research and development and continually value teamwork. Thus, they are more likely to adopt innovations like ABC, to adapt their costing systems to changes and to adopt a sophisticated costing system. These prospectors are recognized by their organic structures (Gosselin, 1997).

Defenders have opposite strategies to prospectors. They produce a limited number of products in large quantities and aggressively compete on price, quality and customer services. Defenders invest little in research and development and focus on improving manufacturing processes. They usually have mechanistic structures and are less able to respond to the environmental uncertainty compared to prospectors (Slocum et al., 1985; Govindarajan, 1986). Analysts are a middle class between the prospectors and the defenders. They do not pursue any well-defined strategy.

Simons (1990) has shown that management control systems differ among organizations according to their strategy. Furthermore, Gosselin (2000) argued that the decision to adopt and implement ABC depends on the company's strategy. He found that prospectors are more likely to adopt ABC and activity-based management approach compared to defenders. In addition, Nimtrakoon and Tayles (2015) found that companies pursuing a prospector strategy are more likely to have benefits from developed management accounting practices. Furthermore, Cadez and Guilding (2008) provide evidence that prospector's strategy is positively assosciated with the use a strategic management accounting. Consequently, the following hypothesis is formulated:

H_6: the prospector strategy positively affects the level of sophistication of costing systems.

III. RESEARCH SAMPLE AND METHODOLOGY

In this paragraph, we present the data collection method, the characteristics of the sample, the measurement of variables and the model to be analyzed.

3.1. Data Collection and Sample Selection

To collect data, we used a questionnaire next to a sample of Tunisian companies. The sample selection was made by referring to the choices of Innes and Mitchell (1995) and Moalla (2007). In line with Moalla (2007), we choose large and medium sized companies as these companies have generally more resources to implement management accounting systems. Concerning the sector, we note that in the eighties and nineties, costing systems mainly concern industrial companies. From the 2000s, several studies have been interested in costing systems in service and trade (Moalla, 2007). Thus, our sample is composed of manufacturing and non-manufacturing companies. The population is made up of 3340 companies. Only companies with more than 50 employees were considered. This choice is justified by the absence of a costing system for most small companies. The questionnaire was sent to a random sample of 378 companies (i.e. the minimum size required for a representative sample with a 95% confidence interval is of 345 companies). Several telephone and e-mail reminders were made. The total number of valid responses was of 68 which represents a response rate of 18%.

The questionnaire was administrated by e-mail, telephone and direct contact. It was accompanied by a cover letter explaining the purpose of the research and its usefulness. The questions are an expression of the measurement of the variables composing the studied model. Only companies having a costing system were considered.

Response bias was analyzed by comparing the distribution of the 20 early and the 20 late responses based on the four measures of the dependent variable. The results of the Mann-Whitney U test and those of the Chi-square test show the absence of response bias. In addition, the comparison of the distribution of respondents and that of non-respondents, based on size and sector reveals no problem of non-response bias.

3.2. Measurement of Variables

3.2.1. The Dependent Variable

To measure the sophistication of costing systems, we referred to Al-Omiri and Drury (2007). Therefore, the following measurements are used: 1) whether to use ABC (i.e. the ABC system is classified as a sophisticated system, while the other systems are classified as non-sophisticated systems), 2) whether to use a full-costing system (i.e. the full-costing system is classified as a sophisticated system, while the other systems are classified as non-sophisticated systems), 3) the number of cost pools used in the primary allocation, and 4) the number of cost drivers in the secondary allocation.

3.2.2. The Independent Variables

1) Importance of cost information

In line with Al-Omiri and Drury (2007) and in order to measure the importance of cost information, we asked respondents to indicate their degree of agreement on each of the four following items regarding the use of costing data within their organization: The cost of products or services must be highly reliable to compete in the market; cost data are extremely important due to cost reduction efforts; cost information is the most important factor when making product/price ratio decisions; the company performs many special studies related to the introduction of products/services, their abandonment, re-design or cost reduction decisions. A 5-points Likert scale was used.

2) Product diversity

In accordance with Al-Omiri and Drury (2007), we used four items to measure product diversity: we asked respondents about the differences in sales volumes between the 20% best-selling items and the 20% least-sold items, and about the differences in sales volume between various products and services. In addition, we asked about the need for similar resources for the design, manufacture/supply and distribution of products and services, and the similarity in consumption of support service resource costs (e.g. information processing, procurement, and marketing) by each product/service line. A 5-points Likert scale was used to specify the degree of respondent's agreement on each of the above items.

3) Cost structure

Several studies have measured the variable "cost structure" by the percentage of overhead (e.g. Clarke et al., 1999, Drury & Tayles, 2005). In accordance with previous research, we measure cost structure by the percentage of indirect costs.

4) Competitiveness of the environment

The measure of Al-Omiri and Drury (2007) was chosen for the competitiveness of environment. Respondents were asked to indicate their degree of agreement on the following statements: the company faces intensive external competition; the level of competition in the market for the main products (or services) is extremely intense; during the last ten years, the level of competition of company's products (or services) has increased significantly; price competition is extremely intense.

5). Size

In line with, Drury and Tayles (2005) and Al-Omiri and Drury (2007), the size of the company is measured by the natural logarithm of its turnover.

6). Strategy

To measure strategy, each respondent was asked to indicate which of the four provided descriptions corresponds to his company. Each description corresponds to one of the four following strategies of Miles and Snow (1978): prospectors, defenders, analyzers and reactor.

The following model was performed in order to test the hypotheses.

$$\mathbf{Y_i = \alpha_0+\alpha_1 ImpoInf_i+\alpha_2 Diversity_i+\alpha_3 IntenEnv_i+\alpha_4 Indcosts_i+\alpha_5 Size_i+\alpha_6 Industry_i+\alpha_7 Strategy_i+\varepsilon} \quad \text{..... (1)}$$

Where:

i : firm i;

Y: sophistication of costing system (measured by the four following proxies: ABC system; full costing system; number of cost pools and number of cost drivers);

ImpInfor: importance of cost information;

Diversity : diversity;

IntenEnv: the competitiveness of the environment;

Indcosts : percentage of indirect costs;

Size : size of the company;

Industry : industry; and

Strategy : strategy.

IV. EMPIRICAL RESULTS

4.1. Descriptive Statistics

Table 1 presents the descriptive statistics of the continuous variables and dummies. The results show that most companies are pursuing either "defenders" or "prospectors" strategies. Indeed, non-tabulated results show that all ABC adopters are prospectors.

Table 1
Descriptive Statistics

Continuos Variables					
Variables	**Mean**	**Std. Dev.**	**Min**	**Max**	**N**
Number of Cost Pools	6.5	8.858	1	42	68
Number of Cost Drivers	3.015	3.230	1	15	68
Importance of Cost Information	3.643	0.910	1.75	5	68
Diversity	2.270	0.991	1	4.333	68
Competitiveness of the Environment	3.526	0.680	1.75	4.75	68
Indirect Costs	33.515	17.662	15	70	68
Size	8.716	1.904	5.768	12.651	68

Dummies			
Variables	**Percent.**	**Freq.**	**N**
ABC/Non-ABC system:			
ABC	17.65	12	68
Non-ABC	82.35	56	
Full Costing/Partial Costing:			
Full Costing	58.82	40	68
Partial Costing	41.18	28	
Industry:			
Manufacturing	55.88	38	68
Other sectors	44.12	30	
Strategy:			
Prospector	27.94	19	68
Defender	38.24	26	
Analyzer	11.76	8	
Reactor	22.06	15	

4.2. The Validity and Reliability Tests of Measurements

As part of this research, we checked the unidimensionality, reliability and validity of the three following perception variables: importance of cost information, product diversity and the intensity of the competitive environment. The measurement of the accuracy of the Kaiser-Meyer-Olkin sampling and the principal axis factoring showed the unidimensionality of the perception variables. The eigenvalue of the first axis is greater than 1 and this axis explains 68.27, 58.2 and 47.37 percent of the total variance respectively for the importance of cost information, product diversity and competitiveness of the environment.

Cronbach alpha is of 0.85, 0.73 and 0.61 of the total variance respectively for the importance of cost information, product diversity and intensity of the competitive environment.

4.3. Correlation Analysis

We used the Shapiro-Wilk test to check for the normality of continuous variables. These variables were not normally distributed and thus, we used Spearman correlation matrix. Results presented in Table 2 confirm that no problem of multi-collinearity was found between independent variables. In addition, the mean VIF value of 1.64, with a maximum of 2.06 confirms the absence of multi-collinearity problems.

Table 2
Spearman Correlation Matrix

	ImpoIn	Diversity	IntenstEnv	Indirect Costs	Size
ImpoIn	1				
Diversity	0.504	1			
IntenstEnv	0.403	0.427	1		
Indirect Costs	0.367	0.386	0.357	1	
Size	0.488	0.659	0.418	0.375	1

4.4. Regression Results

In order to analyze the effects of the independent variables on the sophistication of costing systems, we conducted four regressions as follows: two logistic regressions (i.e. for the sophistication measured by 1) the use of an ABC system, and 2) the use of a full costing system) and two Poisson[1] regressions (i.e. for the sophistication measured by the number of cost pools and the number of cost drivers). The findings are in Table 3. A robust standard error is used to correct for heteroscedasticity.

Results show that the importance of cost information positively affects the use a full costing system. This finding may be explained by the fact that companies using full costing systems consider that cost information is important for decision making. Companies with a high percentage of indirect costs have a greater number of cost pools. This confirms that firms with a high percentage of indirect costs should use a sophisticated costing system. This allows them to avoid the arbitrary allocation of indirect costs. The diversity is positively associated with the sophistication of costing systems measured by the adoption of ABC, the number of cost pools and the number of cost drivers. These results are consistent with those of Bjornenak (1997), Malmi (1999), and Al-Omiri and Drury (2007), and show that companies having a high degree of diversity requires a sophisticated costing system. Hypothesis 2 is therefore, supported.

[1] Poisson regression is used because the dependent variable is a count variable.

Big sized companies and manufacturing companies are more likely to adopt ABC. These findings confirm the results of previous research (e.g. Moores & Chenhall, 1994; Bjornenak, 1997; Abdel-Kader & Luther, 2008; and Ahmad & Zabri, 2015) and may be explained by the fact that big sized companies have more resources to adopt sophisticated costing systems than small companies.

No relationship was found between the competitiveness of the environment and the sophistication of costing systems. Thus, the competitiveness does not discriminate between the sophisticated and non-sophisticated costing systems. Hypothesis 4 is not supported. These finding are opposite to the results of Ahmad and Zabri (2015), according to which the intensity of competition is one of the most important factors that affect the use of a costing system in Malaysian SME. However, our results are in line with those of Albu and Albu (2012) that provided evidence of a poor relationship between competition and the management accounting practices in Romania. Our results can be explained by the fact that Tunisian firms facing a competitive environment seek to solve production and marketing problems rather than costing problems. They focus on the improvement of their production process and marketing choices which are judged to be more important than costing system problems. In addition, prospectors adopt sophisticated costing systems, based on full costing and basically on ABC, on a high number of cost pools and cost drivers. Hypothesis 6 is therefore supported. Moreover, defenders are more likely to use full costing systems and a high number of cost pools. However, analyzers are more likely to use a low number of cost pools. These findings are in line with those of Gosselin (1997) and may be explained by the innovativeness of prospectors. In fact, prospectors seek new management accounting systems like ABC and new products and services in order to respond to the needs of their customers. As a result, companies use sophisticated costing systems to manage the complexities occurred by the continuous changes.

Strategy and diversity are the most important factors that affect the sophistications of costing systems. They are related to different dimensions of the sophistications. These results may be explained by the fact that companies with a high level of diversity use a sophisticated costing system that can manage the complexity of this diversity. In addition, the use of a sophisticated costing system is one of the strategic elements of companies, mainly those adopting a prospector strategy. They seek to be innovative in all areas including the management accounting area.

For panel C and D, besides the Poisson regression, we used the negative binomial regression because the Poisson regression is based on the hypothesis of the equality between the mean and the variance of the dependent variable. This hypothesis is rarely supported. The negative binomial regression provides the same results.

Table 3
Regression Results

	Panel A ABC Vs Non-ABC		**Panel B Full Costing Vs Non-full Costing**	
	Logistic Regression		**Logistic Regression**	
Variables	**Coefficients**	**P-value**	**Coefficients**	**P-value**
ImpoIn	0.172	0.885	**1.691**	**0.015****
Diversiy	**4.448**	**0.024****	0.657	0.401
IntenstEnv	0.194	0.897	0.497	0.541
Indirect Costs	0.004	0.916	0.030	0.238

To be continued Table 3.

Size	**4.087**	**0.073***	0.406	0.188
Industry	**2.493**	**0.009*****	0.787	0.321
Strategy:				
Prospector	**0.378**	**0.000*****	**0,398**	**0.010*****
Defender	-0.015	0.781	-0.145	0.878
Analyzer	-0.039	0.505	**-3.568**	**0.073***
Pseudo R^2	0.8249		0.4895	
P-value	0.0063		0.0001	

	Panel C Number of Cost Pools		**Panel D Number of Cost Drivers**	
	Poisson Regression		**Poisson Regression**	
Variables	**Coefficients**	**P-value**	**Coefficients**	**P-value**
ImpoIn	-0.322	0.634	-0.080	0.262
Diversiy	**0.555**	**0.000*****	**0.390**	**0.000*****
IntenstEnv	-0.084	0.298	-0.015	0.848
Indirect Costs	**0.010**	**0.001*****	0.003	0.302
Size	0.061	0.400	0.056	0.319
Industry	0.136	0.330	0.148	0.131
Strategy:				
Prospector	**0.998**	**0.000*****	**1.009**	**0.000*****
Defender	**0.461**	**0.043****	**0.508**	**0.000*****
Analyzer	**-0.604**	**0.039****	-0.074	0.632
Pseudo R^2	0.6468		0.3181	
P-value	0.0000		0.0000	

Notes:

1. Panel A, the dependent variable is the use of an ABC system or a traditional costing system;
2. Panel B, the dependent variable is the use of a full costing system or a direct costing system;
3. Panel C, the dependent variable is the number of cost pools in the first stage of allocation;
4. Panel D, the dependent variable is the number of cost drivers in the second stage of allocation.

V. CONCLUSION

Several previous research were interested in the effect of contingency factors on the adoption of activity-based costing, mainly in developed countries. This study aims to broaden the field of investigation by analyzing the impact of contingency factors on the sophistication of costing systems in a developing country. Four measures of sophistication were used: the use of an ABC system, the adoption of a full costing system, the number of cost pools in the first stage of allocation and the number of cost drivers in the second stage of allocation.

The main results provide evidence that contingency factors affect the sophistication of costing systems. The competitiveness of the environment is the only factor that does not affect these systems. The strategy and diversity are the most important factors affecting the sophistications of costing systems. They were associated with the major components of the sophistication.

This study contributes to the previous research that was either interested in ABC or in the sophistication of costing systems but in developed countries. It is an addition to the few studies investigating the management accounting innovations in emerging

countries and an enrichment for the studies dealing with the impact of contingency factors on costing systems. It adds to knowledge on the contingency factors affecting the characteristics of costing systems in developing countries.

This piece of research may be useful for mangers in choosing the characteristics and the degree of sophistication of their costing systems. Taking into account the internal and external contingency factors may help managers in choosing the appropriate costing system for a better decision-making.

Despite its contributions and practical implications, this research has limitations. The small sample size was the main limitation of this research. In addition, and although we analyzed the most relevant contingency factors, some factors were overlooked. Furthermore, the sophistication of costing systems was analysed based on four separate criteria and these systems were either sophisticated or unsophisticated. Future studies, combining different measures of the dependent variable and leading to a ranking of costing systems in order of sophistication and to the development of a score of sophistication, may provide better explanations of the relationship between costing systems and contingency factors. Further research investigating the role of external actors (e.g. consultants, academics, etc.) in defining the characteristics of costing systems can be conducted. In addition, future qualitative research based on interviews and case studies may be conducted in order provide a better explanation and understanding of the factors that can affect the sophistication of costing systems. It allows an in-depth analysis of these factors.

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