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The Impact of Big Data's Characteristics on the Management Accountant's Role as A Business Partner - A Field Evidence from Egyptian Environment

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Abstract This research aims to study and test the impact of the characteristics of big data on the role of the management accountant as a business partner, using a field study on a sample of management accountants in Egyptian practice environment. The results of the research showed that there is a significant effect of big data on the accounting profession in general, and on the role of the management accountant in particular. The characteristics of big data have led to the expansion of the role of the management accountant in supporting the decision-making process, to become his primary role as a business partner instead of his traditional role. Furthermore, the skill level required of the management accountant has increased. However, big data did not require the management accountant to take on new roles.

Keywords: *big data, management accountant as a business partner, decision making*

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1. Introduction

The management accountant plays an important role within the organization through its support for the decision-making process, performance control, and its contribution to the formulation and implementation of business strategies. In order to fulfill this role, it uses a set of financial and non-financial data, which are structured, have a pre-formatted form, and can be stored in traditional databases, for example, in ERP systems. This is on the one hand, and on the other hand, data storage capacities have increased dramatically, data analysis techniques have developed, and Internet of Things (IoE) technologies have emerged, and all of this has led to the emergence of other types of unstructured data. For example, images, videos, and audio files, data extracted from social media, and data extracted by sensors from machines and devices. This development in the size, types, and speed of available data flows has been known as Big Data, which in turn represents a set of opportunities and challenges facing the roles of the management accountant [1].

The accounting research [2,3,4] focused on the evolution of the management accountant's role from being a traditional role limited to performing calculations and preparing internal reports, to being a more effective role in the management's participation in the control and decision-making processes, which in turn is known as As a Business Partner. Technological development is one of the most important factors in the development of the role of the management accountant [5,6]. Technological developments have made the management accountant a more effective contribution to the decision-making process, and have also led to strengthening the relationship between the management accountant and other departments [7,8].

The emergence of big data is one of the most important technological developments, which is distinguished from traditional data by the large volume of data and the speed of its flow, as it is collected and processed immediately, and its forms vary, as it includes in addition to structured data, unstructured data, and semi-structured data. Laney [9] defined Big data through a 3D framework (3vs), including the dimensions of Volume, Velocity, and Variety. In agreement with this, Herath and Woods [10] showed that big data not only refers to the huge amount of data, but in addition to this, this data is characterized by a high degree of diversity and speed, which makes it difficult to deal with using traditional tools and techniques. The accounting research [11,12] added two more dimensions to this framework, the first of which is; Veracity and their second Value. Ylijoki and Porras [13] argue that adding these dimensions to the definition of big data adds a degree of ambiguity, as it is a description of the use of big data rather than a definition of raw data. Masuke [14]

believes that big data is the flow of a huge amount of diverse information into the organization; they arise from both internal and external sources, which are not easily processed by humans for decision-making purposes and, therefore, require new technology to analyze them.

Big data has led to fundamental changes in how companies conduct their business and in the culture of the decision-making process, which in turn led to a management revolution [15]. Many applications have emerged in the business environment to successfully deal with big data, with the aim of achieving customer satisfaction and maximizing revenues, improving operations efficiency and product quality, discovering opportunities to innovate new products, improving supply chain management, increasing the efficiency of advertising expenditures by improving advertising messages. Moreover, increasing efficiency-advertising channels, improved website design based on browser behavior, and more efficient staff recruitment [16]. Companies directed huge investments to develop their administrative and technological capabilities and the capabilities of their employees in order to benefit from this technological development [17], and this has led to significant impacts on the productivity and profitability of companies [15].

Moreover, companies face a set of challenges in order to achieve maximum benefit from big data. For example, the speed of flow of big data leads, in many cases, to the rapid loss of value; What has value today may not have value in the future, just as the process of extracting value from big data is a difficult and expensive process, and it requires advanced technologies that many companies may not have. In addition, data collection may sometimes be prohibited by law, which varies from country to country [1].

Big data gives the management accountant the opportunity to take on new roles, for example; helping companies evaluate big data as an asset, adding value to it through internal control over it, providing more effective and specialized support for the decision-making process, more accurate assessment of risks and investments, interpreting the results of big data analysis. On the one hand, and on the other hand, translating it into practical actions through planning and building budgets and expectations, and collaborating with data experts and IT staff to guide them to areas that need analysis. The management accountant may also play a role in analyzing big data and providing better support to decision-makers [1,16,18,19,20].

Accounting research [21,22,23,24] attempted to measure and analyze the expected impact of big data on the role of the management accountant, but it did not identify consistent effects. On the contrary, the impact of big data on role of the management accountant provided mixed results. Arnaboldi et al. [22] concluded that management accountants were reluctant to deal with big data, while Al-Htaybat and Alberti-Alhtaybat [21] and Wadan et al. [23] concluded to the integration of management accountants into the big data environment. Which requires the need for more research in this field. Therefore, the current research seeks to find evidence of the impact of big data on role of the management accountant as a business partner, and to explain this relationship in the Egyptian practice environment. Thus, the research problem is to answer the following questions: Does the characteristics of big data affect the role of the management accountant, so that he becomes more involved in the business? Does the characteristics of big data affect the degree of participation of the management accountant in the decision-making process? Does big data affect the management accountant's new roles?

This research derives its practical importance through its endeavor to clarify the impact of big data on accounting profession in general and on management accountant in particular. This comes in light of the growing interest in big data in Egyptian environment now, which may have implications for the efficiency and effectiveness of managers' decisions, and the growth of companies. On the other hand, the research derives academic importance from being in line with accounting research that contributes to increasing the awareness of management accountants of the need to develop the roles and tasks they perform, to face the new challenges posed by the big data environment. Which will change the shape and way of managing companies in the future, and that failure to respond to these developments may jeopardize the value added by management accountants.

To achieve the objective of the research, the remainder of it will be organized as follows: First: theoretical framework and hypothesis development. Second: the research methodology. Third: testing and discussion of research hypotheses. Finally: discussion and conclusion.

2. Theoretical Framework and Hypothesis Development

Professional Bodies, for example; International Institute of Certified Management Accountants (CGMA) and American Institute of Management Accountants (IMA) have examined the impact of big data on role of the management accountant, as they issued a set of reports dealing with this impact, and indicated that management accountants have a fundamental role in helping their organizations benefit from big data. this role is represented in their use because of their financial and business knowledge in order to translate these analyzes into practical actions, through planning, budgeting and performance management, management accountants are also required to work and cooperate with other groups such as: IT workers, data experts and business managers, which requires arming the management accountant with skills better communication and leadership [16].

In the same context, the study conducted by the IMA, in cooperation with British Association of Chartered Certified Accountants (ACCA), concluded that the volume of big data and its diversity between structured and unstructured data, and the accompanying technologies, is an opportunity for the management accountant to play a more effective role in supporting the decision-making process. The spread of self-service data retrieval applications will enable the management accountant to analyze different databases, and not be limited to financial data, which will give him the opportunity to develop his role in three areas: evaluating data as assets, supporting the decision-making process, and risk management [1].

The IMA and ACCA issued another report in 2015, which indicated that there are challenges facing the

utilization of big data, such as cybercrime, data security issues related to it, and advanced data storage capabilities; This led to the emergence of terms such as data management and data governance. The report stressed that as a result, there is a need for people to supervise the quality of the data, and this represents an opportunity for management accountant to play this role; because of his knowledge of the nature of the business and the industry in which he works. The nature of his work also includes data collection, processing and maintaining its quality, in addition to his ability to analyze data, manage risks and measure the impact on performance [25].

In the same context, the study of Yan [26] presented the challenges facing the utilization of big data, which included: Lack of knowledge among management accountants, as the management accountant should not only possess accounting and management knowledge, but must also be familiar with computer-related knowledge and technical knowledge of big data. In addition, information security, which has become one of the biggest challenges in the era of big data, it is likely that big data will become a target for cyberattacks. Thus stealing financial information and selling it to competitors. Finally, increasing the current information storage space, because of its inability to store the huge amount of information.

In addition, the study results of Gray and Alles [18] showed the importance of the management accountant using advanced methods of data analysis, such as the data fracking strategy, which is a strategy aimed at extracting insight from data that helps managers in making decisions through a strategy similar to the method of extracting oil from oil. The study showed that the management accountant is required to play a more effective strategic role, and in order to play this role, he must not only analyze traditional accounting data, but he must also use and analyze other types of unstructured data, which is what is called the term big data.

Brands and Holtzblatt [27] also confirmed the need for the management accountant to analyze the unstructured data alongside the structured data, and indicated that there is a significant development in the role of the management accountant, from the traditional role, to a more effective role in business analysis. In addition, another report carried out by CGMA in 2016 indicated that technical progress in field of data analysis will not be a substitute for the human factor in extracting knowledge, formulating its meaning and learning from it, and that management accountant is qualified to play this role. As he can transform huge data into knowledge that serves decision-making process [28].

Consistent with previous research trends, recent technological developments can affect the role of the management accountant, and with regard to the impact of big data. The study results of Crookes and Conway [29] indicated that there is an unlimited possibility to influence the management accountant; as it became available for use different sets of data; this allows him to provide better support in the decision-making process. At the same time, the diversity of the data poses a challenge to the management accountant in extracting relevant information, as well as the challenge of dealing with both financial and non-financial data; the management accountant must examine different data sets to identify investment opportunities, discover trends, and support the decision-making process. Because of the faster flow and analysis of big data, monthly reports can be produced faster; which gives the opportunity to make better decisions.

In the same context, Richins et al. [20] showed that big data and its analysis will change the role of the accountant, but will not marginalize it. The view of the study depends on two main points: first, that accountants have the ability and experience to successfully deal with and analyze structured data. Second, while unstructured data provides organizations with valuable information, that information must be interpreted in the context of the business environment, and accountants can fulfill this role because of their financial experience, knowledge of the business environment, and strategic thinking. Where they can support data experts in their exploratory analyzes in order to obtain the results of big data analytics, and they can interpret these results by knowing their impact on the financial performance of organizations, and on their strategic goals.

McKinney et al. [30] believes that the management accountant should enter the field of big data analysis, and he must not only rely on data analysis skills, but he must also have a critical mindset that can ask the right questions. Nielsen [31] showed that the use of big data analytics will spread in all areas of traditional accounting, and will affect decision-making processes such as: commodity mix decisions, manufacturing or purchasing, pricing, and strategic decisions, due to the ability of data analytics techniques to process huge amounts of data, and it leads to big data becomes an asset that stands on par with the rest of the organization's assets such as buildings and machines.

Coyne et al. [32] showed that there is a need for big data governance due to the risk of uncertainty associated with the use of big data, and big data governance showed the need for the management accountant to play new non-traditional roles that were not required of him before, as he became required to play the role of the guardian on big data through his participation in the governance of big data. They concluded that accountants possess in-depth experience about the business environment of the organization in which they work, which enables them to play a collaborative role with information technology specialists in the system design and maintenance stage, and accountants also have knowledge of issues governance related to control and regulatory compliance which is an important aspect of information governance.

The studies discussed so far lacked empirical evidence of the impact of big data characteristics on role of the management accountant. Al-Htaybat and Alberti-Alhtaybat [21] tried to bridge that gap. They showed that the mentality of using big data began to spread among accountants, and there are need for accountants to participate in the field of data analysis, as accountants have the financial knowledge required in the decision-making process, with their values that they maintain such as conservatism, reliability, and precaution for risks.

Arnaboldi et al. [22] have varied with Al-Htaybat and Alberti-Alhtaybat [21], they showed the reluctance of accountants to take advantage of the big data extracted from social media; where accountants see that it is data related to workers in the field of marketing and public relations, and they see that its impact on business is

marginal and weak. The results of the study showed that the impact of big data extracted from social media began to capture the attention of middle and senior management, and that this gives great importance to the contribution of workers in the field of social communication. In addition, the researchers believe that this may lead to a decrease in the value of the work of accountants, and they may find themselves eventually specialize in routine work, while workers in other disciplines will take over exploratory work, and their contribution to the decision-making process will become more effective.

Similarly, Toni [33] concluded that the application of big data was one of the factors that led to the development of the role of management accountant in the direction of the role of business partner. With the management accountant, continuing to carry out the traditional tasks, but the effect of the big data in the role of management accountant was significant indirectly; the tasks of preparing budgets and preparing management accounting reports are still dependent on financial data. Moreover, the big data did not lead to a direct change in the main tasks of the management accountant, nor did the management accountant analyze the big data, but that task remained the preserve of data analysts.

In order to explore the factors influencing management accountants' willingness to use big data, Varma [34] used a combination of utility theory and planned behavior theory and the results showed that the most motivating factors for management accountants to use big data are their personal orientation, and the factors related to the opinions of others. Similarly, Wadan et al. [24] reached the following results: Technological development has led to an increased focus on analysis tasks at the expense of reporting. Which has become highly automated, and there is a trend towards statistical analysis methods at the expense of traditional analysis methods, as they were found that the current skills of management accountants in the field of information technology are not commensurate with the requirements of new technological developments. The results also showed that despite the increased demand for data experts, this was not at the expense of the demand for management accountants, and the tasks of data experts constitute the support and basis for the work of management accountants.

In addition, Moll and Yigitbasioglu [35] showed that accounting research did not pay enough attention to studying the impact of these technological developments on the work of accountants. There is an urgent need to understand the developments that we need in accounting, and in the skills and knowledge of accountants to deal with these developments, in order to keep the profession is important, and to add value to the business environment. The results also showed that these developments represent, on the one hand, a threat to the work of accountants, and on the other hand, they provide many opportunities for accountants, so accountants should develop their skills and procedures in order to efficiently control the use of these technologies in organizations. Brink and Stoel [23] showed that the role of accountants in using big data analysis to support decision-making relied heavily on interpreting results more than relying on technical skills in data analysis. In addition, they also developed their skills through the work environment largely than academic methods, problem-solving skills, data communication and interpretation were more important than the skill of presenting data in forms and graphics, and the skills of writing code and statistical methods were less important.

It can be said that big data needs new ways of managing and presenting it, such as methods of analyzing data and presenting it in interactive forms and graphics. Perkhofer et al. [36] showed that there is a gap between the required skills and the practical reality, as sophisticated methods are rarely used in presenting data. Although accountants have begun to use big data from sources such as the Internet of Things and social media, but they still rely primarily on traditional data. This gap is due to the lack of knowledge and experience in interactive data presentation methods, and focusing mainly on the methods already known to the accountant, such as electronic spreadsheets, as a tool for displaying data, instead of the more advanced methods that can extract the full potential of big data.

Herath and Woods [10] finds that big data offers significant opportunities for decision-making in accounting and risk analysis, suggesting that companies can improve their performance, measure performance, manage risk and allow effective decision-making using data analytics. Diaz and Bianchi [37] showed that big data facilitates and improves the implementation of accounting practices related to competitive management, and reduces company response time. In addition, the use of big data leads to improved management forecasts.

The researchers conclude from this that big data represents an opportunity for the management accountant to develop his role in the areas of supporting the decision-making process, risk management, performance evaluation, and cooperation with other departments. In its analysis and interpretation of its results, big data also presents challenges to the management accountant and requires a set of skills from him.

Through the previous presentation, it is clear that big data may affect the role and tasks of the management accountant in several areas such as supporting the decision-making process, cooperating with specialists in other fields, and directing him to the role of the business partner. Big data also provides the opportunity for the management accountant to take on new roles, such as evaluating data, controlling its quality, using advanced analysis techniques, and interpreting the results of data analysis in the context of the work environment. As a result, all of this requires, new skills to interact with the new big data environment [1,16,18,20,21,24,25,27,28,31,32,38,39]. However, this effect has not been sufficiently tested in accounting research [21,22,23,24], and to the extent of the researchers' knowledge, there are no studies to test this effect in Egyptian practice environment. There is also a contradiction in the results of the accounting research. Arnaboldi et al. [22] showed the reluctance of management accountants to deal with big data. In contrast, Al-Htaybat and Alberti-Alhtaybat [21] and Wadan et al. [24] showed the integration of management accountants into the big data environment. To bridge this gap, the researchers seek to test the impact of big data on the role of the management accountant by testing the following hypothesis:

Hypothesis (1): Big data characteristics affect traditional role of management accountant in supporting decision-making process.

Hypothesis (2): Big data characteristics affect role of business partner of management accountant in supporting decision-making process.

Hypothesis (3): Big data characteristics lead to new roles for the management accountant.

3. Research Methodology

The researchers relied on the methodology of the field study. Where the field study aims to test the research hypotheses to measure whether the characteristics of the big data affect the role of the management accountant, leading to the development of his role as a business partner, by testing the impact of the big data on the degree of participation of the management accountant in the decision-making process.

The study was conducted on a population of management accountants working in Egyptian telecom companies. The telecom sector was chosen because it is the leading sector in technological developments, especially in the field of big data. This provides a greater opportunity for the availability of management accountants working in the big data environment. A selective and arbitrary sample of management accountants in these companies was chosen, where a group of management accountants working in telecom companies who have access to big data, and another group of management accountants working in other telecom companies who do not have access to big data, were selected. The researchers distributed 125 questionnaires to management accountants in Egyptian telecom companies. Moreover, 11 questionnaires were excluded due to incomplete data, the researchers obtained 114 completed questionnaires, as the number of correct questionnaires for management accountants who are allowed access to big data reached 55, and the number of correct questionnaires for management accountants reached who do not have access to the big data 59 questionnaire.

In view of the research hypotheses, it becomes clear that there is a main independent variable, which is the big data, and a major dependent variable, which is the role of the management accountant. Three sub-dependent variables are derived from the main dependent variable, and these variables can be measured as follows:

The independent variable: big data. The application of big data can be measured or not by the availability of big data characteristics on the one hand, and the availability of big data analysis capabilities on the other hand. The following table summarizes the big data application measurement items:

Table 1. Items for measuring big data

measurement field	measurement items	Previous studies
Volume	Use of external data warehouses	[40]
Variety	Using unstructured data such as videos, images, audio data, and text data	[16,41]
Velocity	Instant data extraction	[1]
Big data analysis	Appointing experts specialized in big data analysis Availability of advanced software for analyzing big data top management support	[17,42]

Big data was measured by conducting four personal interviews with experts in the field of information technology to identify the telecom companies that own big data. While providing non-experts in big data - such as management accountants - the ability to access and analyze big data, and telecom companies that this possibility is not provided to non-specialists, such as management accountants, and this possibility is provided through specialized programs, and through communication between data experts in these companies and management accountants. Two companies from the first group and two companies from the second group have been identified.

The dependent variable: the role of the management accountant. The researchers relied on a study model [4] to measure the role of the management accountant. This role was measured by the degree of participation in the decision-making process, the extent to which financial and non-financial data are used, the tasks they perform, and the level of skills they need. The researchers made some modifications to the model to suit the purposes of the research. Where the researchers combined the dimension of the use of financial and non-financial data with the dimension of the tasks of the management accountant, and the dimension of the degree of participation in the decision-making process was divided into a traditional role and the role of a business partner. In addition, the tasks of the management accountant to the traditional tasks, and the tasks of the business partner.

The researchers added a new dimension to the model, which is the new roles related to data based on studies [1,16,23,25,32]. Thus, the researchers built a model to measure the role of the management accountant through dimensions: the traditional role of the management accountant in supporting the decision-making process, the role of the business partner of the management accountant in supporting the decision-making process, new roles related to data. The following table summarizes the measurement items for each of the sub-variables as follows:

Table 2. Sub-variables and their measurement items

sub variable	measurement items	Previous studies
The traditional role of the management accountant in supporting the decision-making process	Collect and submit data to management	[4,43,44]
	Analyzing financial data and presenting it to management to support the decision-making process	
The role of the business partner of the management accountant in supporting the decision-making process	Analyzing non-financial data and submitting it to management	
	Provide advice to management and direct it to the best option	
	Discuss management plans and decisions	
New tasks under the huge business environment	Forming work teams with non-financial data analysts	[1,16,23,25,32]
	Valuing data as a valuable asset	
	Quality control of non-financial data	
	Interpret the results of data analysts' analyzes and present them to management	

Each variable will be measured by asking the management accountant about the extent of his agreement with each of those items, and measuring each item on a Likert scale consisting of five degrees, and number (1) indicates that the item is not important, and number (5) indicates that the item is very important.

The research relies mainly on the questionnaire method for data collection. The questionnaire was divided into four parts: an introduction, general questions, questions to measure the role of the management accountant, and a part for comments. The general questions included questions from one to seven, and aimed at measuring the control variables: the administrative level years of experience, professional certificates, and educational qualifications. The third part included nine items to measure the role of the management accountant.

To test the validity and reliability of the scales used to measure the study variables, the alpha-Cronbach coefficient was relied upon as a measure of the stability of the measuring tool. The scale is considered to have an acceptable degree of stability if the coefficient exceeds 0.60. Table 3 shows that Cronbach's alpha coefficient exceeds 0.60 for all scales used. Table 3 also shows the corrected correlation coefficient. The statement is considered consistent with the rest of the statements if the corrected correlation coefficient exceeds 0.3, which is shown in Table 3 by the availability of this for all statements.

To verify the validity of the scales used, the following was relied upon:Apparent validity and validity of the arbitrators: The questionnaire used, including the statements it includes to measure the different variables under study, was distributed to six arbitrators with specialization and experience in the field, and their modifications in the formulation of the statements were taken into consideration. Structural validity of the variables: the chi-square test was relied upon for each of the questions included in the questionnaire to test the randomness of choosing the different alternatives for the question. Which leads to close or equal number of repetitions for each alternative (which is the null hypothesis for the test) in contrast to the fact that the choices for the other different alternatives are not made randomly; in the sense of understanding the question among the respondents (imposing the alternative to the test). The P-Value for the questionnaire's statements was less than the level of significance of 5%. Therefore, the researchers can reject the null hypothesis and accept the alternative hypothesis that the participants answered those statements in a non-random manner (that is, the respondents understood the statements).

Depending on the factorial analysis of the scales used, the following table shows that the percentage of information extracted exceeds 50% for all variables, and the loading coefficient shows that all expressions have load coefficients of more than 0.5. Table 3 shows a summary of the statistical results:

Table 3. The statistical results of the validity and stability of the study variables

subvariable	statements	percentage of information extracted	corrected correlation coefficient	Load coefficient	Chi-Square		Cronbach's Alpha
					Statistics	Symp.Sig	
The traditional role of the management accountant in supporting the decision-making process	Collect and submit data to management	0.518	0.373	0.531	16.47	0.000	0.684
	Analyzing financial data and presenting it to management to support the decision-making process		0.350	0.858	17.42	0.000	
The role of the business partner of the management accountant in supporting the decision-making process	Analyzing non-financial data and submitting it to management	0.862	0.825	0.912	38.54	0.000	
	Provide advice to management and direct it to the best option		0.783	0.954	33.28	0.001	
	Discuss management plans and decisions		0.689	0.829	50.12	0.000	
New tasks under the huge business environment	Forming work teams with non-financial data analysts	0.571	0.708	0.865	20.66	0.000	0.853
	Valuing data as a valuable asset		0.531	0.746	65.89	0.000	
	Quality control of non-financial data		0.347	0.562	80.66	0.000	
	Interpret the results of data analysts' analyzes and present them to management		0.649	0.826	27.05	0.000	

4. Testing and Discussion of Research Hypotheses

The researcher used the Mann-Whitney Test - which is the non-parametric alternative to the T-test for two independent samples when the parametric test conditions are not met - at a significant level of 5%. Table 4 summary of Statistical Results:

Table 4. Statistical results of the study's hypotheses tests

subvariable	applying big data	Not applying big data	Mann-Whitney Test	
	mean	mean	value test	Asymp
The traditional role of the management accountant in supporting the decision-making process	4.29	4.40	1339	0.091
The role of the business partner of the management accountant in supporting the decision-making process	3.82	1.75	48	0.000
New tasks under the huge business environment	2.05	1.91	1543	0.652

The first hypothesis was formulated to test the impact of the characteristics of big data on the traditional role of the management accountant in supporting the decision-making process. This role was measured through the following items: the importance of collecting and presenting data to management to support the decision-making process, and analyzing financial data and presenting it to management to support the decision-making process. To test the impact of big data, the extent to which there are signifacal differences between companies that apply big data and those that do not apply big data was tested through the Mann-Whitney test, as the results showed that the P-Value is greater than the 5% level of significance, and therefore we cannot reject the null hypothesis. The application of big data does not have a signifacal impact on the traditional role of the management accountant in supporting the decision-making process.

By analyzing the answers of the respondents, it was found that the mean of the participants' answers under the application of big data was 4.29, which is not signifacal different from the mean in the absence of the application of big data, which amounted to 4.4.

This result is consistent with Paulsson [4], where the results showed that the development of the role of the management accountant does not mean replacing the traditional role for him, and that it is difficult to find the management accountant the pure business partner. Graham et al. [45], Cooper, and Dart [46] showed an expansion in the role of the management accountant, not a shift from the traditional role to the role of the business partner, just as the role of the business partner is not a substitute for the traditional role of the management accountant. On the other hand, this result differs with the opinion of Toni [33] that the importance of the reports provided by the management accountant to the management it will decrease in light of the application of big data because of its mechanization. The researchers believe that the traditional role of the management accountant in supporting the decision-making process remains equally important because of the management of the companies under study using big data as a complement to traditional financial reports. In addition, not as a substitute for them, and that there is still a need for the human role in its preparation.

The second zhypothesis was formulated to test the impact of the application of big data on the role of the business partner of the management accountant in supporting the decision-making process. This role was measured through the following items: analyzing non-financial data and presenting it to management to support the decision-making process, providing advice to management and directing it to the best option, discussing plans and decisions with management. To test the impact of big data, the extent to which there are signifacal differences between companies that apply big data and those that do not apply big data was tested by conducting the Mann-Whitney test. Where the results showed that the P-value is less than the 5% level of significance, and therefore the null hypothesis can be rejected and accepted the alternative hypothesis is that the application of big data has a significant impact on the role of the business partner of the management accountant in supporting the decision-making process.

By analyzing the answers of the respondents, it was found that the mean of the respondents' answers in light of the application of big data was 3.82, which is higher than the mean of the participants in the absence of the application of big data, which amounted to 1.75. We conclude from this that there is a greater role for the management accountant, the business partner, in supporting the decision-making process in light of the application of big data. The result of this hypothesis was consistent with the results of [1,6,28,29,47] that big data will help management accountants provide more effective support in the decision-making process.

The third hypothesis was formulated to test the impact of the application of big data on the management accountant's performance of new roles related to non-financial data. It was measured through the following items: forming work teams with non-financial data analysts, evaluating data as valuable assets, controlling the quality of non-financial data, interpreting results of data analysts analyzes and present to management. To test the impact of big data, the extent to which there are signifacal differences between companies that apply big data and those that do not apply big data was tested by conducting the Mann-Whitney test, as the results showed that the P-value is greater than the 5% level of significance, and therefore the null hypothesis cannot be rejected. Therefore, there is no significant impact of the application of big data on the management accountant's performance of new roles related to non-financial data.

By analyzing the answers of the respondents, it was found that the mean of the participants' answers under the application of big data was 2.05, which is not much different from the mean in the absence of the application of big data, which amounted to 1.91. The result of this hypothesis was consistent with the findings of two studies [22,33] that management accountants are still reluctant to integrate big data technology into their work.

5. Discussion and Conclusion

The main research question was: Do the characteristics of big data affect the role of the management accountant? In order to answer this question, a set of sub-questions

were extracted, namely: Do the characteristics of big data affect the degree of participation of the management accountant in the decision-making process? Do the characteristics of big data affect the tasks of the management accountant? Does the characteristics of big data lead to new roles for the management accountant? In order to answer the questions of the study, the researchers conducted a field study in the Egyptian practice environment, where a questionnaire was distributed to a group of companies that applied big data, and another group of companies that did not apply big data, and statistical tests were conducted to answer the questions of the study.

The results of the study concluded that:

- The application of big data did not affect the traditional role of the management accountant in supporting the decision-making process, as this role remained of the same importance.
- The application of big data has led to an increase in the importance of the role of the business partner in supporting the decision-making process, which indicates an expansion in the role of the management accountant, rather than a transition from the traditional role to the role of the business partner.
- The application of big data led to a decrease in the importance of the traditional tasks of the management accountant, but it remained important from the point of view of management accountants.
- Increasing the importance of the tasks of the business partner, which supports the idea of an expansion in the role rather than a transition from the traditional role to the role of the business partner.
- The application of big data has not led to the management accountant performing new data-related roles; this may be because the management accountants under study prepare roles for non-financial data outside the scope of their specialization.

In the light of the objectives of the research and its problem, and the results it reached in both its theoretical and field aspects, the researchers recommend the following:

- Increasing the awareness of management accountants of the importance of big data, and its significant effects on the business environment, in accounting, and in the roles that accountants will play in the future.
- Motivating the management accountant to use other types of data other than the financial statements in order to provide more effective support in the decision-making process.
- Increasing the management accountant's awareness of the necessity of developing his role to that of a business partner and not being limited to his traditional role.
- The need for the management accountant to take the initiative and take on new roles in the big data environment, where there is competition from workers in other disciplines such as data experts and analysts. The management accountant is developing a role whose importance may weaken in the future.
- Developing curricula to include modern technological developments such as big data, and methods of analyzing, presenting, and benefiting from them in the decision-making process and performance evaluation.
- The professional bodies specialized in the accounting profession in Egypt educate their members about the impact and importance of big data, and the challenges that the profession has become facing in the big data environment, in addition to designing training courses to raise the level of their members so that they can deal with big data.

In addition, the researchers suggest a number of future research areas, the most important of which are the following:

- Conducting other studies to test the impact of big data on the roles of professionals in other disciplines, such as internal auditors, external auditors, and financial accountants.
- Conducting case studies for companies applying big data in order to get a deeper understanding of the impact of big data on the role of the management accountant.
- Developing an integrated framework for measuring the role of the management accountant, as there is no unified framework for measuring this role in previous studies.

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