

The Role of Big Data Analytics in Risk Management in the Saudi Banks: Investigation Study

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Abstract. This research aims to determine the role of using the big data analytics in the process of managing risks in the Saudi banks and to summarize the main dimensions of the process of risk management in the Saudi banks as well as the main features of the big data analytics. This study is based on collecting data through distributing a questionnaire to a sample who responsible for risks management within the Saudi banks. In addition, the research made a desk study from literature review to achieve the research's objectives. According to the findings of the study, there is a statistical significant relationship between using big data analytics and achieving positive results in the risk management process in Saudi banks in general. There is a positive correlation, the value of which is nearly 0.5. This study, also, reveals that there is a statistical significant relationship between using the big data analytics and achieving positive effects in the process of risk reduction in the Saudi banks. There is a positive correlation, the value of which is near to one (0.8 nearly). In addition, the study reveals that there is a statistical significant relationship between using the big data analytics and achieving positive effects in the process of risk avoidance in the Saudi banks. There is a positive correlation, the value of which is near to one (0.9 nearly). Finally, the researchers recommend the necessity of applying big data analytics in the Saudi banks properly in order to improve the quality of risk management process more and more. Doing so will lead to positive changes in operating processes in Saudi banks.

Keywords: Big Data Analytics, Risk Management, Banks, Saudi Arabia.

1. Introduction

1.1 Preface

The form of big data analytics enforced in several fields of the banking industry helps in rationalizing the decision-making process and risk management. It does not only save cost, time and effort of the bank directors, but also helps in developing a deep understanding of the bank's operations with its customers, detection of frauds and risk management. In the Kingdom of Saudi Arabia, growth in the banking sector

has facilitated development of the financial sector and has increased the number of business transactions. This, consequently, requires the need for techniques like adopting big data analytics for risk management and other purposes.

1.2 Research Problem

To optimally use the available resources and achieve targets in banks in the Kingdom of Saudi Arabia, it is key to use the big data analytics in the process of risk management.

Hence, the problem of this research is determining how to reap the benefits of using big data analytics in the risk management process. In other words, this research is trying to determine the impact or the role of using the big data analytics in the process of risk management in the Saudi banks.

1.3 Research Hypotheses

In terms of the research problem, this research is based on the following hypotheses:

- “There is a significant relationship between using the big data analytics and achieving positive effects in the process of risk management in the Saudi banks”.

- “There is a significant relationship between using the big data analytics and achieving positive effects in the process of risk reduction in the Saudi banks”.

- “There is a significant relationship between using the big data analytics and achieving positive effects in the process of risk avoidance in the Saudi banks”.

1.4 Research Questions

To test the research hypotheses, this research includes the following questions:

- A. What are the main dimensions of the process of managing risks in the Saudi banks?
- B. What are the main features of the big data analytics?
- C. How to achieve the maximum benefits from using the big data analytics in the process of managing risks in the Saudi banks?

1.5 Research Objectives and Importance

To explain how the research questions are related to the research hypothesis, this research aims to achieve two main objectives as follows:

- **The first objective** is concerned with summarizing the main dimensions of the process of risk management in the Saudi banks and the main features of the big data analytics.
- **The second objective** is concerned with determining the relationship between using the big data analytics and achieving positive effects in the process of managing risks in the Saudi banks.

Therefore, the significance of this research lies in the necessity of achieving positive effects in the process of risk management in Saudi banks, and thus achieving the optimum exploitation of Saudi Arabia's available resources in accordance with the Kingdom Vision 2030. This means that applying big data analytics in the Saudi banks properly will improve the quality of risk management process more and more.

1.6 Research Methodology

This research was conducted in two parts:

Section One: A theoretical study of the main dimensions of the process of managing risks in the Saudi banks will be conducted with the main features of the big data analytics. This will be done by reviewing, analysing and discussing the suggestions presented in the literature related.

Section Two: An empirical study will be conducted, based on testing the impact of using the big data analytics and achieving positive effects in the process of risk management in the Saudi banks. This will be done by collecting data through distributing a questionnaire to a sample who responsible for risks management within the Saudi banks.

1.7 Research Limitations

The research limitations are:

- A. This research will concentrate on the relationship between using the big data

analytics and the process of risk management in the Saudi banks.

- B.** The research will be applied to a sample of Saudi banks during 2011 – 2020G.

1.8 Research Structure

In order to achieve the research objectives, this research is divided into the following parts:

Part 1: Introduction

Part 2: The Literature Review

Part 3: The Empirical Study

Part 4: Summary, Conclusions, and Recommendations.

2. The Literature Review

2.1 Previous Studies

There are numerous studies that are related to this issue due to the importance of using big data analytics in achieving several advantages and benefits in risk management in the field of banks, such as Abu Hussain & Al-Ajmi's study ^[1] aimed at reporting empirical evidence regarding the risk management practices of banks operating in Bahrain. A sample of bankers was surveyed through a questionnaire. This study reveals that banks in Bahrain are found to have a clear understanding of risk and risk management, and have efficient risk identification, risk assessment, risk monitoring, credit risk analysis and risk management practices. In addition, credit, liquidity and operational risk are found to be the most important risks facing both conventional and Islamic banks. The risk management practices are determined by the extent to which managers understand risk and risk management, efficient risk identification, risk assessment, risk monitoring and credit risk analysis. Islamic banks are found to be significantly different from their conventional counterparts in understanding risk and risk

management. The levels of risks faced by Islamic banks are found to be significantly higher than those faced by conventional banks. Similarly, country, liquidity, and operational, residual, and settlement risks are found to be higher in Islamic banks than in conventional banks.

Furthermore, Ismail's study ^[2] dealt with the gap between theory and practice of risk management in the field of banks in the Kingdom of Saudi Arabia. The primary goal of this study was to investigate the risk management process in order to assess the level of board involvement in risk management practices. This study uses surveys in order to collect opinions regarding the risk management process. The study suggests that banks in the Kingdom of Saudi Arabia have an efficient risk management process and an adequate understanding of risk management. In addition, the study reveals that there is a high level of board involvement in assessing, analyzing, monitoring and controlling risk efficiently, where they are somewhat reasonably efficient in managing risk.

In addition, Srivastava & Gopalkrishnan's study ^[3] aims to capture how big data analytics is being successfully used in the banking sector. The data used is secondary data from a bank. This study reveals some of the best practices used by banks around the world, which can be replicated by Indian banks to improve their financial service offerings to customers.

Cerchiello & Giudici's study ^[4] aimed to develop a systemic risk model that, unlike existing ones, employs not only the information contained in financial market prices, but also big data coming from financial tweets. According to this paper, the estimation of systemic risk models is using two different data sources, financial markets and financial tweets, and a proposal to combine them, using a

Bayesian approach. The paper presents the first systemic risk model based on big data, and shows that such a model can shed further light on the interrelationships between financial institutions. The paper demonstrates how to use tweet data to estimate systemic risk networks.

Additionally^[5], intends to explore the existing literature on the fundamental concepts of big data and predictive analytics to clarify the evolution and definitions of big data and predictive analytics to explore the upcoming opportunities and challenges of big data and predictive analytics, and to identify gaps in existing research and identify further research directions on the role of big data and predictive analytics. This paper reveals that big data analytics is an interdisciplinary field, which combines knowledge of data science, statistics, mathematics and computer science.

Moreover^[6], aims to examine the opportunities in and possibilities arising from big data in retailing, particularly along five major data dimensions—data pertaining to customers, products, time, location and channel. This study reveals that a combination of new data sources, smart statistical tool application, and domain knowledge combined with theoretical insights accounts for a large portion of the increase in data quality and application possibilities.

Also, Ref. [7] aims to understand the impact of big data analytics in the decision-making process in the banking sector in Saudi Arabia. To this end, the researcher studied 5 commercial banks in Riyadh and included a survey method with ten management / higher level authority per bank via a questionnaire. This study reveals that the big data analytics helps in targeted marketing, which, in turn, helps in better decision making in the banking sector in the Kingdom of Saudi Arabia.

Ref. [8] aims to explain why banks need to have the business information systems application in order to cover any losses from their activities. This paper covers the latest amendments proposed by the Basel Committee for managing the banking risks through the process of risk management. All the necessary steps in the process are explained in this paper. This paper reveals that as a monetary authority, the support and development of the Basel applications in the banking industry is the most effective option and is a critical necessity for internationally serving banks around the world to continue their activities in a well manner.

Likewise^[9], aims to investigate how small banks are facing technological challenges, showing the state of art about the actual use of the techniques of big data analytics in supporting the risk management process. This study tries to identify the skills required of the risk management in the digital age for using the big data analytics. This study reveals that the big data analytics has worth in the banking sector in the field of risk management.

Meanwhile^[10], aims to investigate how the big data analytics technologies can lead to the development of intelligent industrial Internet of Things systems. The paper presents the frameworks and case studies of the various enterprises that have benefited from big data analytics. It also calculated the significant opportunities presented by big data analytics in the intelligent industrial Internet of Things. The paper developed a taxonomy by classifying and categorizing the literature on the basis of important parameters (e.g. data sources, analytics tools, analytics techniques, requirements, industrial analytics applications and analytics types). The paper, also, presents several research opportunities, challenges, and future technologies.

Based on the above-mentioned studies, big data analytics have an important role in

generally and in risk management in particular. Each study focused on one or more aspects or issues related to the research topic in a variety of settings.

The shortcomings and gap in previous work are that these studies do not cover the role of using of big data analytics in risk management in the Saudi banks. However, the current study tries to measure the role of using big data analytics in risk management in the Saudi banks.

2.2 Risk Management in the Saudi Banks

According to ISO 31000, risk is the effect of uncertainty on objectives. Risk is an aspect of nearly every bank decision. Thus, it is necessary to manage risk in every bank.

Enterprise risk management has received extraordinary international attention. In response to growing expectations for effective

risk management across the entire enterprise, many leading organizations are deserting their traditional approach to managing risks, where risks areas are managed in isolation from one another, and are adopting an enterprise risk management approach (see for example: [11] & [12]).

Risk management is an action that avoids, reduces, transfers, separates, eliminates risk by using decision trees, expert interviews, workshops, SWOT Analysis, and probability and impact matrix. It is the managerial process involving the executive functions of planning, organising, leading, and controlling activities in a bank relative to specified risks. Risk management is important as it assists banks in setting strategy, achieving objectives and making rational decisions [13], [14]. However, risk management methods can be summarized as follows:

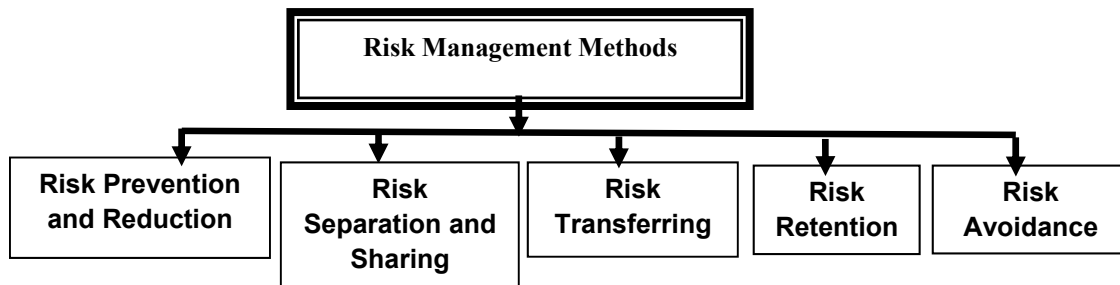


Fig. 1. Risk Management Methods.

Major risks for banks include credit, operational, market, and liquidity risks. Since banks are exposed to a variety of risks, they have well-constructed risk management infrastructures and are required to follow government regulations.

Due to the large size of some banks in Saudi Arabia, overexposure to risk can cause bank failure and impact millions of people. Governments can set better regulations to encourage prudent management and decision-

making by better understanding the risks posed to banks. The ability of a bank to manage risk also affects investors' decisions. Even if a bank can generate large revenues, lack of risk management can lower profits due to losses on loans. Value investors are more likely to invest in a bank that is able to provide profits and is not at an excessive risk of losing money.

Saudi banks can use big data analytics to identify risks that may affect the bank. In addition, big data analytics provides fast and

precise fraud identification and reduces damage done by fraudulent activity. In the next point, the role of big data analytics in risk management will be explained.

2.3 The Main Features of Big Data Analytics

Big data analytics provides a variety of features that aid in increased productivity and improved services in the banking sector [3], [15]. This leads to increased profitability and delivers high rate of efficiency in the banking operations.

Big Data refers to large and complex data sets, and implies gathering, managing and processing large quantities of data in different formats to explore patterns and draw insights that help in smart decision making. Big data include big volume, Big Variety big analysis, big Infrastructure and big value (see for example: [16] & [17]).

Big Data analytics tools help users collect and analyze large and varied data sets to explore patterns and draw insights. This data can be anything from customer preferences to market trends, and is used to help the decisions- making process like risk management. The term "Big Data" refers to the varied form of digital data made by firms whose characteristics (large volume, different forms, speed of processing) require specific and increasingly sophisticated computer storage and analysis tools. (see for example: [18] & [19]). Big data analytics requirements should be (see for example: [20] & [21]):

- ✓ Data Processing including data mining, data modelling, file exporting and data file sources.
- ✓ *Predictive applications*
- ✓ *Analytics*
- ✓ *Reporting features*
- ✓ Security features and fraud management

- ✓ *Technologies support*
- ✓ *real-time analytics and reporting*
- ✓ *Data management and governance*

When banks implement big data analytics into their risk management efforts, they are better able to identify risks that could potentially infect the bank. In the banking industry, big data analytics identifies opportunities for emerging technologies that can provide efficient and sustainable financial services. The major key to using big data analytics in risk management is having a powerful risk prediction model. When banks use a powerful risk prediction model for their risk management efforts, they will receive faster response times, more extensive risk coverage and extensive cost savings.

The role of big data analytics in risk management can be summarized as follows:

A- Identify trends and potential risks: Big data helps in comparing internal and external data, enabling detecting and safeguarding from threats

B- Make accurate forecasting and decision-making: With the introduction of big data, it is becoming easier than ever to create detailed forecasts, enabling banks to make key decisions decisively and confidently. Big data enables managers to easily detect and analyze patterns that could signal a crisis or a sudden change in the markets or even individual accounts. However, it is necessary to ensure that the collected data is from primary sources to allow for accurate forecasting.

C- Improving capital efficiency: By identifying areas of risk in the bank, it is possible to get rid of assets weighted down by risk and free up capital reserves for added growth.

The fundamental elements of risk management are the identification, evaluation,

and prioritization of risks, as well as steps taken to minimize the negative aspects of risks, such as monitoring and controlling. Each of the elements in risk management has a direct correlation with the application of big data.

The vast stores of historical data, as well as real-time big data analytics, provide a significant system to extract valuable information instantly. When coupled with strong predictive analytics that assess possible risks, banks can decrease uncertain cases and increase clarity in decision-making.

Big data analytics offers a global vision of different sectors and areas where financial risk may appear. However, big data analytics have a great importance in risk management, but there are many obstacles to overcome. As long as banks continue to take small steps towards implementing big data programs, they will be able to identify any weakness or area of risk within the bank.

Big data enhances the quality of risk management models, especially predictive models, by simulating many scenarios to realize all the potential risks associated with all financial transactions.

It offers a variety of features in terms of risk management, fraud detection, customer segmentation, credit scoring, text mining, bank marketing and monitoring the behavior of the clients ^[22].

To successfully use big data, banks should first collect internal data. After internal data has been collected, external data should also be collected. While collecting a good amount of data is beneficial, an integrated process of analysis is more important to effectively use big data, which will be done by using integrated models for analyzing.

Applying big data analytics can offer several solutions in the form of fraud detection and risk management.

3. The Empirical Study

3.1 Outline

To achieve the second research objective that is related to determining the relationship between using the big data analytics and achieving positive effects in the process of managing risks in the Saudi banks, an empirical study has been done. A questionnaire was made and distributed to those who are responsible for risks within the Saudi banks.

The research population was the Saudi banks, and the sample was the Saudi banks in Riyadh city and nearby cities. 48 responses were collected via google forms and personally.

The research sample was chosen at random, and Riyadh and its surrounding cities were chosen as a source of data collection due to the difficulty of collecting data from all over the Kingdom, which would take a significant amount of time, effort, and money. In addition, the majority of banks headquarters that are responsible for risk management are in Riyadh city.

A questionnaire was designed after the review of previous studies related to the subject of the study. The questionnaire was divided into four sections, the first section dealing with demographic data in order to obtain general data (5 items). The second section deals with data regarding various aspects of risk management practices. (8 items), while the third section is related to using the big data analytics by the bank in managing the various types of risks (9 items). The fourth section deals with any suggestions related to the research issue (1 item).

The researchers measured the degree of **validity** of the questionnaire used based on the scientific judgment of some specialized researchers (especially faculty members at

universities) with regards to the clarity of the measuring tool, and its ability to achieve its purpose. According to the opinions of the selected referees, the wording of some questions has been amended, some questions have been cancelled and others have been added, in order to achieve the objectives of the research.

The researchers also measured the **reliability**, using Cronbach's Alpha, and the total reliability factor was 0.87 for 17 items (section 2 and section 3 items).

The degree of validity can also be measured as follows:

The degree of validity = the square roots for reliability coefficient, *i.e.* the degree of validity = 0.93.

This means that the questionnaire items can measure what they have already been developed to measure, as well as the clarity of the questionnaire questions, paragraphs and vocabulary, and that they are understandable to those who will be included in the sample, as well as that the collected data is valid for statistical analysis.

3.2. Presenting and Discussing the Results

3.2.1 Description of the research sample (demographic data)

In this section, the researchers deal with a description of the research sample. The research sample, according to their gender, is depicted in Table 1.

Table 1. The Distribution of the Research Sample According to Their Gender

Gender	Frequency	Percentage
Male	23	48%
Female	25	52%
Total	48	100%

From Table 1, it can be seen that the highest percentage of responses came from females, representing 52%. While the percentage of male respondents represents

48%. However, there is no big gap between the two types of respondents, and the majority of respondents is females. This means that risk directors or managers within Saudi banks includes males and females.

The research sample, according to their qualifications, is depicted in Table 2.

Table 2. The Distribution of the Research Sample According to Their Qualifications.

Qualifications	Frequency	Percentage
Bachelor Degree	37	77%
Master Degree	10	21%
Ph.D. Degree	1	2%
Total	48	100%

From Table 2, it can be seen that the highest percentage of responses came from those have bachelor degrees, representing 77%. However, the percentage of respondents with a Master Degree represents 21% and the respondents with a Ph.D. represents only 2%. This means that the survey concentrates on people who have bachelor degree. This reflects that there is direct relation between working in the field of risk management the academic degree.

The research sample, according to their position, is depicted in Table 3.

Table 3. The Distribution of the Research Sample According to Their Positions.

Positions	Frequency	Percentage
Risk manager	38	79%
Risk analyst	6	12.5%
Employee in a risk management	4	8.5%
Total	48	100%

From Table 3, it can be seen that the highest percentage of responses comes from risk managers, representing 79%. The second rank is risk analysts, representing 12.5%. Whereas, employees in a risk management come at the third rank, representing 8.5%. This means that the survey concentrates on people who employ in the risk management field in

Saudi banks. This will help collect the required data regarding the research objectives. Thus, this will help in evaluating the current position in risk management in the Saudi banks. So, this will support the study results and achieving its objectives.

The research sample, according to their experiences, is depicted in Table 4.

Table 4. The Distribution of the Research Sample According to Their Experiences.

Experience Period	Frequency	Percentage
Less than 10 years	22	46%
10 – Less than 20 years	8	16.5%
More than 20 years	18	37.5%
Total	48	100%

From Table 4, it can be seen that respondents have less than 10 years of experience score the highest, representing 46%, while the respondents who have 10 to less than 20 years of experience score the lowest, representing 16.5%. Whereas, respondents who have more than 20 years of experience come at the second rank, representing 37.5%. This means that the respondents have different periods of experiences. This will reflect different point of views regarding risk management in the Saudi banks, and so will support the study objectives.

3.2.2 Description of the Various Aspects of Risk Management Practices

Respondents' responses regarding the various aspects of risk management in their banks can be summarized in Table 5.

From Table 5, it can be seen that the Saudi banks' risks are assessed by using both quantitative and qualitative methods. Other people participate the bank risk staff for doing risk identification. Some respondents (9%) disagreed with that it is easy in the bank to do risk identification. In addition, some respondents (9% only) disagreed with that the bank effectively monitors and controls its risks. This result agreed

with Ismail's study (2013) that found that there is a high level of board's involvement in assessing, analyzing, monitoring and controlling risk efficiently within the Saudi banks. However, the majority of respondent (82%) agreed that the bank monitors and controls its risks based on a clear plan. This result agreed with Abu Hussain & Al-Ajmi's study (2012) that found the banks in Bahrain have a clear understanding of risk and risk management.

Banks, generally, have been leaders in risk management due to the emphasis on risk management in global regulation as a way to reduce a bank's minimum capital requirements [23].

3.2.3 Using the big data analytics by the bank in managing the various types of risks

Using the big data analytics by the bank in managing the various types of risks is depicted in Table 6.

From Table 6, it can be seen that the majority of respondents (73.5%) said that their banks apply the big data analytics in risk management for all kinds of risks. However, 44% said that it is not easy to apply the big data analytics in risk management at the bank. In addition, 26.5% of respondents said that their banks face problems in applying the big data analytics in risk management. Therefore, 26.5% of respondents said that their banks apply other techniques in risk management in the bank. 82% of respondents think that applying the big data analytics in risk management lead to reducing risks, whereas 85% of respondents think that applying the big data analytics in risk management leads to avoiding risks. Finally, 97% of respondents think that applying the big data analytics will help, in general, in risk management at the bank.

3.2.4 Suggestions Related to the Research Issue

There are some suggestions from respondents as follows:

Some respondents said that it is best to use new techniques for risk management, while other respondents said that it is best to use better and faster techniques for risk management. In addition, some respondents said that it is best to other techniques with the big data analytics.

3.2.5 Testing the research hypotheses

From Table 6, it can be seen that the standard error of mean of question: “Do you think that applying the big data analytics will help, in general, in risk management at the bank?” is less than 0.05 with confidence more

than 95%. Thus, the first hypothesis is acceptable. Moreover, it can be seen that standard error of mean of question: “Do you think that applying the big data analytics in risk management lead to reducing risks?” is less than 0.05 with confidence more than 95%. Thus, the second hypothesis is acceptable. In addition, it can be seen that the standard error of mean of question: “Do you think that applying the big data analytics in risk management lead to avoiding risks?” is less than 0.05 with confidence more than 95%. Thus, the third hypothesis is acceptable.

Table 5. the various aspects of risk management practices.

Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	S. Dev.	Var. Coef.	St. error of mean
Risk Identification:									
The bank applies techniques for risk identification.	0	0	6%	44%	50%	4.44	0.61	0.14	0.061
It is easy in the bank to do risk identification.	0	9%	6%	44%	41%	4.17	0.90	0.21	0.090
The bank risk staff who do only risk identification.	9%	2%	15%	62%	12%	3.67	1.03	0.28	0.103
Risk Assessment:									
This bank's risks are assessed by using quantitative methods.	0	6%	35%	53%	6%	3.59	0.69	0.19	0.069
This bank's risks are assessed by using qualitative methods.	0	9%	24%	62%	5%	3.63	0.72	0.20	0.072
It is easy to do risk assessment at the bank.	9%	12%	29%	21%	29%	3.49	1.27	0.36	0.127
Risk Controlling:									
The bank effectively monitors and controls its risks.	0	9%	24%	38%	29%	3.87	0.93	0.24	0.093
The bank monitors and controls its risks based on a clear plan.	0	0	18%	61%	21%	4.03	0.62	0.15	0.062

Table 6. Using the big data analytics by the bank in managing the various types of risks.

Questions	Yes	No	Mean	S. Dev.	Var. Coef.	St. error of mean
Do you have a full idea regarding the big data analytics?	73.5%	26.5%	1.74	0.44	0.25	0.044
Do you apply the big data analytics in risk management?	88%	12%	1.88	0.32	0.17	0.032
Do you apply the big data analytics in risk management for all kinds of risks?	73.5%	26.5%	1.74	0.44	0.25	0.044
Is it easy to apply the big data analytics in risk management at the bank?	56%	44%	1.56	0.50	0.32	0.050
Do you face problems in applying the big data analytics in risk management?	73.5%	26.5%	1.74	0.44	0.25	0.044
Do you apply other techniques in risk management in the bank?	73.5%	26.5%	1.74	0.44	0.25	0.044
Do you think that applying the big data analytics in risk management lead to reducing risks?	82%	18%	1.82	0.38	0.21	0.038
Do you think that applying the big data analytics in risk management lead to avoiding risks?	85%	15%	1.85	0.36	0.19	0.036
Do you think that applying the big data analytics will help, in general, in risk management at the bank?	97%	3%	1.97	0.17	0.09	0.017

Table 7. The Correlation value of using big data analytics in the Saudi banks and improving the quality of Risk Management process.

Statement	Correlation Value
applying the big data analytics in risk management lead to reducing risks	0.78817
applying the big data analytics in risk management lead to avoiding risks	0.879049
applying the big data analytics will help, in general, in risk management at the bank	0.47624

From Table 7, it can be seen that there is a positive correlation between using big data analytics in the Saudi banks in risk management and reducing risks process. The correlation value is near to one (0.8 nearly). Moreover, it can be seen that there is a positive correlation between using big data analytics in the Saudi banks in risk management and avoiding risks process. The correlation value is near to one (0.9 nearly). In addition, it can be seen that there is a positive correlation between

using big data analytics in the Saudi banks in risk management and improving risks management process generally. The correlation value is 0.5 nearly.

4. Summary, Conclusions and Recommendations

The core of this paper has involved an examination of the role of big data analytics in improving the efficiency of risk management in general and in the Saudi banks in particular.

This research aims, also, to summarize the main dimensions of the process of risk management in the Saudi banks and main features of the big data analytics.

The study reveals that there is a significant relationship between using the big data analytics and achieving positive effects in the process of risk management in the Saudi banks generally. Moreover, there is a positive correlation and the correlation value is nearly 0.5. Furthermore, this study reveals that there is a significant relationship between using the big data analytics and achieving positive effects in the process of risk reduction in the Saudi banks. Moreover, there is a positive correlation and the correlation value is near to one (0.8 nearly). In addition, the study reveals that there is a significant relationship between using the big data analytics and achieving positive effects in the process of risk avoidance in the Saudi banks. Moreover, there is a positive correlation and the correlation value is near to one (0.9 nearly).

Finally, the researchers recommend using big data analytics in the risk management process in general and in the Saudi banks, in particular, in order to improve the efficiency of this process.

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Appendix A

QUESTIONNAIRE

Dear Sir/Madam,

I am going to study the role of big data analytics in risk management in banks in the Kingdom of Saudi Arabia. I would appreciate your point of view regarding the risk management applications at your bank. Your specific response to the questions here will help me in completing my paper. I assure you that all responses to this questionnaire will be kept STRICTLY CONFIDENTIAL and used for academic research purpose only.

I thank you in advance for your valuable time and participation in this questionnaire. Your valuable contribution to this questionnaire will open new horizons for the development of the banking sector in Saudi Arabia. For further queries, please do not hesitate to contact the researcher.

Best regards,,,,,

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استبيان

عزيري / عزيزتي

أحيطكم بأنني سأدرس دور تحليل البيانات الضخمة في إدارة المخاطر في البنوك في المملكة العربية السعودية. سأكون ممتناً للرأي الذي تفضله بشأن ممارسات إدارة المخاطر في البنك الذي تعمل فيه. إن ردمكم المحدد على الأسئلة هنا سيسهل عليّ إنجاز بحثي. وأؤكد لكم أن جميع الردود على هذا الاستبيان سوف تبقى سرية للغاية وتستخدم لغرض البحث الأكاديمي فقط. أشكركم مقدماً على وقتكم الثمين ومشاركتكم في هذا الاستبيان. ومساهمتم القيمة في هذه الاستبيان ستفتح آفاقاً جديدة لتطوير القطاع المصرفي في المملكة العربية السعودية. لمزيد من الاستفسارات، لا تترددوا في الاتصال بالباحث.

مع أطيب تحياتي،،،،،

Part I

القسم الأول

The purpose of this section is to obtain general data related to you as a participant in this questionnaire

الغرض من هذا القسم هو الحصول على بيانات عامة ذات صلة بك كمشارك في هذا الاستبيان

Gender: _____ Age: _____ Qualifications: _____ Position: _____ _____ Experience Period _____	الجنس: _____ العمر: _____ المؤهلات: _____ المركز الوظيفي: _____ مدة الخبرة: _____
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Part II

القسم الثاني

This section has been designed to obtain data regarding various aspects of risk management practices.

وقد صُمم هذا القسم للحصول على بيانات تتعلق بجوانب مختلفة متعلقة بممارسات إدارة المخاطر .

Statements العبارة	Strongly Disagree غير موافق بشدة	Disagree غير موافق	Neutral محايد	Agree موافق	Strongly Agree موافق بشدة
Risk Identification: تحديد الخطر					
The bank applies techniques for risk identification البنك يطبق تقنيات لتحديد المخاطر					
It is easy in the bank to do risk identification من السهل في البنك القيام بتحديد المخاطر					
The bank Risk Staff who do only risk identification موظفو المخاطر بالبنك هم الذين يقومون فقط بتحديد المخاطر					
Risk Assessment: تقييم الخطر					
This bank's risks are assessed by using quantitative methods يتم تقييم مخاطر البنك باستخدام الطرق الكمية					
This bank's risks are assessed by using qualitative methods مخاطر البنك باستخدام الطرق النوعية					
It is easy to do risk assessment at the bank من السهل القيام بتقييم المخاطر بالبنك					
Risk Controlling: مراقبة الخطر					
The bank effectively monitors and controls its risks. يراقب البنك مخاطره ويتحكم فيها بشكل فعال.					
The bank monitors and controls its risks based on a clear plan. يراقب البنك مخاطره ويتحكم بها بناء على خطة واضحة.					

Part III

القسم الثالث

This section is related to using the big data analytics by the bank in managing the various types of risks:

يرتبط هذا القسم باستخدام تحليلات البيانات الضخمة من قبل البنك في إدارة أنواع مختلفة من المخاطر:

الأسئلة Questions	Yes نعم	No لا
Do you have a full idea regarding the big data analytics? هل لديكم فكرة كاملة عن تحليلات البيانات الضخمة؟		
Do you apply the big data analytics in risk management? هل تطبقون تحليلات البيانات الضخمة في إدارة المخاطر؟		
Do you apply the big data analytics in risk management for all kinds of risks? هل تطبقون تحليلات البيانات الضخمة في إدارة المخاطر لجميع أنواع المخاطر؟		
Is it easy to apply the big data analytics in risk management at the bank? من السهل القيام باستخدام تحليلات البيانات الضخمة في إدارة المخاطر بالبنك؟		
Do you face problems in applying the big data analytics in risk management? هل تواجهون مشاكل في تطبيق تحليلات البيانات الضخمة في إدارة المخاطر؟		
Do you apply other techniques in risk management in the bank? هل تطبقون تقنيات أخرى في إدارة المخاطر في البنك؟		
Do you think that applying the big data analytics in risk management lead to reducing risks? هل تعتقد أن تطبيق تحليلات البيانات الضخمة في إدارة المخاطر يؤدي إلى تقليل المخاطر؟		
Do you think that applying the big data analytics in risk management lead to avoiding risks? هل تعتقد أن تطبيق تحليلات البيانات الضخمة في إدارة المخاطر يؤدي إلى تجنب المخاطر؟		
Do you think that applying the big data analytics will help, in general in risk management at the bank? هل تعتقد أن تطبيق تحليلات البيانات الضخمة سيساعد بشكل عام في إدارة المخاطر في البنك؟		

Part IV

القسم الرابع

Do you have any suggestions related to the research issue?

هل لديك أي اقتراحات تتعلق بموضوع البحث؟

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دور تحليلات البيانات الضخمة في إدارة المخاطر في البنوك السعودية: دراسة استقصائية

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المستخلص. يهدف هذا البحث إلى تحديد دور استخدام تحليلات البيانات الضخمة في عملية إدارة المخاطر في البنوك السعودية، وتلخيص الأبعاد الرئيسية لعملية إدارة المخاطر في البنوك السعودية، وكذلك السمات الرئيسية لتحليل البيانات الضخمة. وتستند هذه الدراسة إلى جمع البيانات من خلال توزيع قائمة استبيان على عينة من المسؤولين عن إدارة المخاطر بالبنوك السعودية. بالإضافة إلى ذلك، أجرى الباحثان دراسة نظرية مكتبية، وذلك لتحقيق أهداف البحث. وقد توصلت الدراسة إلى أن هناك علاقة ذات مغزى إحصائي بين استخدام تحليلات البيانات الضخمة وتحقيق نتائج إيجابية في عملية إدارة المخاطر في البنوك السعودية بشكل عام، وهناك ارتباط إيجابي، تبلغ قيمته حوالي 0,5. كما توصلت هذه الدراسة إلى وجود علاقة ذات مغزى إحصائي بين استخدام تحليلات البيانات الضخمة وتحقيق آثار إيجابية في عملية الحد من المخاطر في البنوك السعودية. وهناك ارتباط إيجابي قيمته قريبة من الواحد الصحيح (0,8 تقريباً). بالإضافة إلى ذلك، توصلت الدراسة إلى وجود علاقة ذات مغزى إحصائي بين استخدام تحليلات البيانات الضخمة وتحقيق آثار إيجابية في عملية تجنب المخاطر في البنوك السعودية. هناك ارتباط إيجابي، قيمته قريبة من الواحد الصحيح (0,9 تقريباً). وأخيراً، يوصي الباحثان بضرورة تطبيق تحليلات البيانات الضخمة في البنوك السعودية بشكل صحيح من أجل تحسين جودة عملية إدارة المخاطر أكثر وأكثر. وبالتبعية تحقيق تغييرات إيجابية في العمليات التشغيلية في المصارف السعودية.

الكلمات المفتاحية: تحليلات البيانات الضخمة، إدارة المخاطر، البنوك، المملكة العربية السعودية.

