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The Role of Big Data Analytics Capabilities in Enhancing Strategic ambidexterity: An Analytical Study of the Opinions of a Sample of Employees in a Number of Travel Companies in Duhok City

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Abstract

This paper will attempt to outline the contribution made by the capabilities of the big data analytics, in terms of its component dimensions of data analytics management capabilities, information technology infrastructure, analytical skills, to strategic ambidexterity and its dimensions, exploratory ambidexterity and exploitative ambidexterity. The key research question that underlines the investigation is the following: do the capabilities of big data analytics contribute in a significant way to the strategic ambidexterity in the investigated organization?

In order to answer this question, a hypothetical theoretical framework has been developed and a descriptive-analytical methodological approach selected to inform the study. The main method of data collection was the establishment of a structured questionnaire that was used as the primary data collection tool and the analysis tool as well.

The sample used in the study was an empirical one; that is, a group of employees working in travel and tourism companies within Duhok City-Iraq; a sample of sixty employees received the questionnaire to give their views and opinions. The data will be analyzed with the help of the SPSS statistics tool, version 26, with the help of a collection of different statistical methods, which will be used to obtain targeted results, as well as to create a consistent set of conclusions and recommendations to be taken.

Keywords: *Big Data; Big Data Analytics Capabilities; Strategic ambidexterity; Travel and Tourism Companies.*

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1. Introduction

As a result of challenges, the pressures facing modern business, the traditional, mundane forms of functioning and strict orientation with regard to simply relieving the emerging organizational issues seem to be more and more incompatible with the requirements of a new age full of continuous change and unceasing development. This contradiction can be seen especially in areas like human resource management, organizational behavior of the employees, the changing needs of the consumers, the changing strategies of the competing companies. This, in turn, forces managers to embrace and use current concepts and strategies, which can strengthen and improve the strategic ambidexterity of the present-day organizations, thus enabling them to navigate the upcoming changes within the business environment and at the same time, increase their ability to identify and leverage the opportunities that arise (Akter et al., 2016).

To achieve this imperative, business organizations need to adopt the ideas and resources that facilitate the discovery and capitalization of opportunities. One of such relevant tools is big-data analytics that provide organizations with the ability to store and handle large amounts of data related to competitors, consumers, and stakeholders (Grover et al., 2018). This analysis ability enables organizations to identify and embrace the opportunities in such a way they help to create value to the customer and improve overall performance.

2. Section One: Study Methodology

2.1. First: The Research Problem

Against this backdrop of the fast paced technological and informational changes and the growing stressor factors to the business establishments especially in the travel and tourism sector in the Iraqi background, we find the competition becoming more volatile and dynamic. Consequently, this forces companies to embrace innovative philosophies and ideas that can enable them to deal with these issues. Such adaptation may be attained through maximization of the existing and potential resources and augmenting their aptitude to recognize and seize the prospects that fulfill consumer requirements and tastes, ensuring the sustainability in the long term and dominance over other contenders.

In order to outline the research gap that still remains, as well as to explore the mechanism underlying positive relationship between the two variables in question, the researchers conducted preliminary field surveys on a range of tour operators located in the city of Duhok. These operational investigations were aimed at recording subtle dynamic operation and to offer a solid descriptive foundation on which further analytical modeling can be developed.

The field research also showed a high lack of responsiveness of the firms to customer requests, especially when compared to the ability to adapt to changes in booking patterns, including changes in flight schedules and itinerary changes. This empirical finding highlighted the significant vulnerability of the working strength of the reviewed organizations, thus indicating a strategic concern of relevance.

As such, the research came to the conclusion that the implementation of big-data analytics as the so-called pioneer of modern technological innovation was an urgent requirement in enhancing the strategic responsiveness of the case organizations in question. The main question that defined the problem of the research was as follows:

Is the ability of big data analytics in the improvement of strategic ambidexterity in the analyzed organizations?

From this main question, the following sub-questions are derived:

i. How extensively do the organizations under study incorporate the big data analytics capabilities into their operation processes?
ii. Do the organizations that are studied have the necessary background components that are required to promote strategic ambidexterity?
iii. How far do big-data analytics capabilities contribute to the process of strategic ambidexterity strengthening?

2.2. Second: The Importance of the Study

The **importance** of this study stems from the significance of the investigated variables and the selected field of study. Its importance can be clarified as follows:

a) Cognitive Importance:
The theoretical constructions that have been presented in this paper shed light on the relationships existing between big-data analytics capabilities and strategic ambidexterity, outlining the manner in which these constructs affect each other. Through a strict analysis of these forces, the study would add to the academic body of knowledge on the premises of its field, thus contributing to the development of the academic depth and encouraging further studies.

b) Practical Importance:
The results have practical implications for practitioners working in the organizations that are studied. They provide practical insights that may guide strategic planning and facilitate rapid and evidence-based decision-making in an effort to improve the competitive advantage. Organizations can become more effective and efficient in pursuing their goals by finding and embracing new opportunities through the incorporation of the latest big-data analytics features.

2.3. Third: The Objectives of the Study

The study aims to achieve the following objectives:

a. To determine how far the industry that is being analyzed believes in such underlying assumptions that are inherent in the current study on big data analytics capabilities and organizational strategic ambidexterity.
b. To ascertain the extent to which the capabilities of the big data analytics and strategic ambidexterity are operationalized in the subject organizations.
c. To clarify the character of relationships and the extent of impact among the factors in study in the realms of disciplinary field.

2.4. Fourth: The Study Model and Hypotheses

In the theoretical framework formulated in the available literature on the capabilities of big data analytics and strategic ambidexterity, and considering the defined research problem and objectives, the researchers created a hypothetical model that showed the correlation between as well as directional impact of these variables as shown in Figure (1).

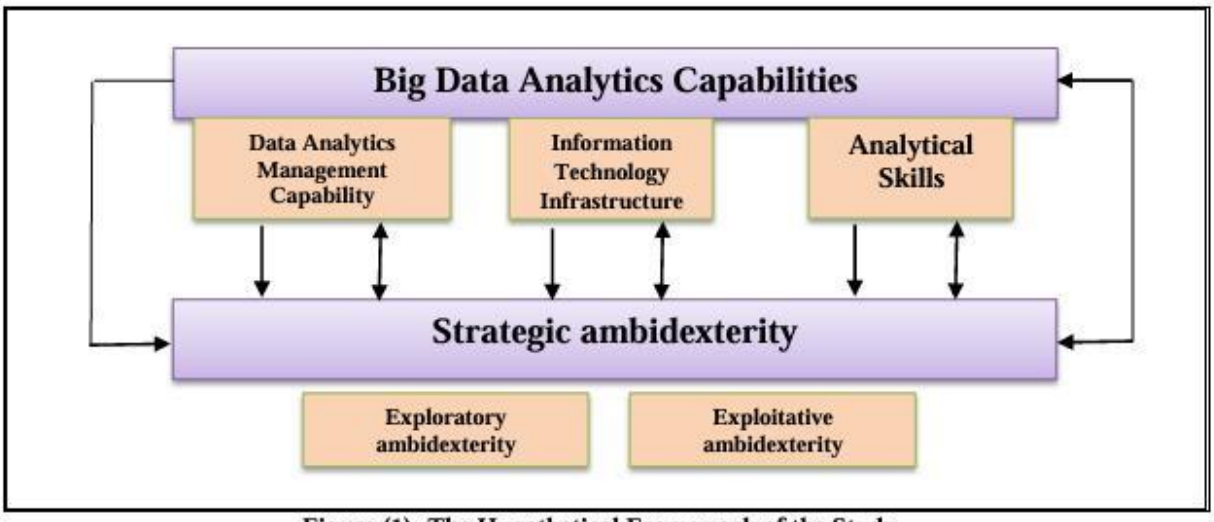

Figure (1): The Hypothetical Framework of the Study

Correlation Relationship ⟷ *Impact Relationship* ⟶

Source: Prepared by the Researchers.

Within the framework of the study model, the following hypotheses emerge:

Main Hypothesis 1:

There is a statistically significant correlation relationship between big data analytics capabilities and strategic ambidexterity. From this, the following sub-hypotheses are derived:

- There are statistically significant relationship data analytics management capability and strategic ambidexterity.

- There is a statistically significant relationship between information technology infrastructure and strategic ambidexterity.

- There is a statistically significant relationship between analytical skills and strategic ambidexterity.

Main Hypothesis 2:

There is a statistically significant effect of big data analytics capabilities on strategic ambidexterity. From this, the following sub-hypotheses are derived:

- Analytical skills have a significant impact on strategic ambidexterity.

- Information technology infrastructure has a significant impact on strategic ambidexterity.

- Data Analytics Management Capability has a significant impact on strategic ambidexterity.

2.5. Fifth: Study Methodology and Data Collection Tools

The study methodology relied on the descriptive-analytical approach that was intended to describe the phenomenon to be investigated, as well as to examine the connections between its variables in a systematic and objective way. The primary data collection tool that will be used in the study is the questionnaire that will help to determine quantitative and qualitative data related to the research goals. The questionnaire had several parts which included demographic details and significant variables to the hypothesis of the research.

There were 70 questionnaires handed to the target sample of the study population. A total of 55 questionnaires were obtained out of these giving a response rate of 78.57. Upon data screening and confirmation, however, 52 of the questionnaires were discovered to be complete and ready to undergo statistical analysis, thus yielding a valid response rate of 74.28 percent of the forms that were returned. The data obtained were coded and complied with the Statistical Package of the Social Sciences (SPSS) wherein the descriptive statistics, reliability tests, and correlation analysis were performed to establish the research objectives and test the hypotheses of the study.

2.6. Sixth: Study Population and Sample

The target population was all the employees in the travelling companies of Duhok city. The sample used in the study involved sufficient workers within the researched organizations, and (52) respondents were used.

2.7. Seventh: Study Boundaries

The boundaries of the study are defined according to spatial, temporal, human, and thematic dimensions as follows:

- **a. Spatial Boundaries:** The research is physically restricted to air transport companies in the city of Duhok-Iraq.
- **b. Temporal Boundaries:** The time frame of the study is limited to the time period November 1, 2024, to Jun 1, 2025.
- **c. Human Boundaries:** The research is also restricted to the employees employed in the travel companies in Duhok city.
- **d. Thematic Boundaries:** The research problem will have two key variables, Big Data Analytics Capabilities as an independent variable, and Strategic ambidexterity as the dependent variable, comprising their sub-dimensions.

3. Section Two: Theoretical Framework

3.1. First Axis: Big Data Analytics Capabilities

a) The Concept of Big Data

Big Data, as one of the key issues of computer systems, was initially introduced by researchers Cox and Ellsworth in 1997, as one of the challenges of computer systems that cannot analyze large quantities of data when its available data and information are too big to fit in the main memory (Nozari et al., 2021). Alternatively, big data is seen as a component of the Fourth Industrial Revolution or what is referred to as Industry 4.0 (Khan & Tao, 2022).

When organizations are able to manage and analyze big data, have capabilities, and skills, then there are genuine chances of attaining a competitive advantage. A solid analytical ability may play a crucial role in making decisions in different levels of an organization (Dietrich et al., 2015; Kościelniak and Puto, 2015). (Vardarlier and Silahtaroglu, 2016) define the notion of big data as very large datasets, which are interrelational and originated in various forms such as (log files, transactional databases, and social networks).

Big data has various attributes that include variation, volume and value. According to (Agarwal and Dhar, 2014), it has been described as information that is rightly directed or targeted to the right timing, right form and in a more advanced format than that which was being used in the previous times. In the meantime, (Bahga and Madisetti, 2019) explained big data as the data that cannot be handled, processed, stored, or analyzed easily with the help of the conventional data analysis tools. Big data cannot be easily retrieved or stored due to the lack of the ability to be broken down into main groups (Addo-Tenkorang and Helo, 2016). It forms a starting point of enhancing and aiding the decision-making process and profitability growth (Gobble, 2013). The extraction of insights through big data can also generate new value to the change of the market trends, organizations and the environment as a whole (Richards & King, 2014). (Shabbir and Gardezi, 2020) indicated that the elements of big data include: structured data, unstructured data, and semi-structured data.

The researchers consider that the big data is the result of multiple business activities and operations in various areas, which include project management, governmental activities and the process of exchange of goods and services via domestic and international trade, as well as the proliferation of digital devices.

b) Characteristics of Big Data

Big data is described to possess some benefits and capabilities that allow its content to be rendered in a flexible manner, and sustainably. There are different features of big data which have been brought out by scholars and experts. It is reported by many researchers that it is highly valued, grows fast and has large volumes as indicated by (Chen & Chen, 2022; Anwar et al., 2018; Zaitsava et al., 2023; Sun, 2018). These characteristics are detailed as follows:

• **Volume:** This is the big and huge volume of data obtained by the daily operations and activities of the organization and data obtained in the external environment. This form of expansive amount of data is a true challenge to business organizations in terms of the required capacity to process and store this data. The importance of the volume characteristic on the data analysis process is highly noted to exist due to the effects it influences in the process of extracting knowledge of different types.

• **Velocity:** This is the rate at which the data is done and moved to and out of the other subsystems as required. One of the most critical needs of modern organizations is low data latency.

• **Variety:** This implies the diversity of data types and forms. Data is of three primary types: structured data which is presented as tables in databases, semi-structured data, which includes XML and JSON formats, and unstructured data that is represented by text, pictures, and video clips.

• **Veracity:** This can be explained as the data quality, or accuracy of data, i.e., the reliability of the source of data and the accuracy of data. Big data can be full of noise, redundancies or false

information. Thus, analysis reliability is enhanced by using data cleaning algorithms and anomaly detection methods.

• **Value:** This is the final objective of dealing with big data that is reflected in deriving knowledge and insights to aid decision-making, enhance performance, and introduce new economic opportunities. To do so, one can use tools like predictive analytics and machine learning to derive this value.

c) Big Data Analysis Capabilities (BDAC)

Business organizations must understand that the actual value that can be obtained based on the relying, using, and implementation of the big data technologies would give them a strategic competitive edge. As the amount of data and its types have increased dramatically, data analytics capabilities have been seen to improve considerably in both external and internal settings (Mikalef et al., 2019).

The deliverables of the big data analytics facilities should be such that they offer a sound technological platform that allows the organization to effectively record, obtain, process, store, and retrieve important data. This infrastructure must not only provide the availability of data but also its accuracy, consistency and timeliness to provide sufficient information to make informed decisions. In addition, it must have high-quality access to information across data lifecycle such as data retention, transfer, and retrieval.

To do this, the organizations have to utilize the use of advanced storage applications, e.g. distributed database and the cloud-based systems, and the use of highly efficient servers, which have the ability to process large amount of data. The infrastructure is also based on management and integration software that can integrate incompatible sources of data, provide seamless interoperability and provide real-time analytics. Also, the system should have advanced deployment tools which enable effective scaling, monitoring as well as maintenance of data workflows. Together, these capabilities allow organizations to obtain actionable insights based on huge amounts of data without losing its security, reliability, and operational efficiency (Khan & Tao, 2022).

The concept of BDAC refers to an organization's ability to capture, store, process, and analyze large volumes of data in various forms, and to provide information to stakeholders in a way that allows organizations to extract high value from big data effectively (Albergaria & Jabbour, 2020). (**Grover et al., 2018)** highlighted that BDAC reflects the capabilities to enhance business activities through the application of statistical methods, tools, and large-scale data analytics.

Moreover, (**Yang and Ge, 2022)** stated that BDAC indicates the capacity of an organization to use and exploit its resources and data analytics infrastructure in association with its marketing resources and capabilities. It also entails information technology capabilities with a focus on innovation that results in better organization performance.

d) Dimensions of Big Data Analysis Capabilities (BDAC)

Researchers such as (Ferrais et al., 2019), (Davenport, 2014), (Wamba et al., 2017), (Mikalef et al., 2019), (Hao et al., 2019), (Akter et al., 2016), and (Lin et al., 2016) indicated that the main dimensions of big data analytics capabilities consist of data analytics management, information technology infrastructure, and analytical skills. These dimensions are detailed as follows:

i. **Data Analytics Management Capability**

Capabilities are one of the dimensions that offer a vital assistance to the decision-makers during the planning and policy-making processes as well as adoption of programs, all of which are involved in the attainment of organizational goals. Such capabilities rely on high investments, and incessant coordination and effective control systems to make sure that resources are well utilized and strategic objectives are constantly achieved. In addition, sound organizational competencies enable sound decision-making and make the organization more decisive to react to both internal and external opportunities and threats.

ii. **Information Technology Infrastructure**

This dimension shows the technological maturity of the organization and the digital infrastructure that helps it to handle, run, process, and analyze big data. It is noteworthy that this readiness is in line with the users of the system's outputs needs. Information technology infrastructure encompasses hardware, software as well as communication networks that allow users to access the necessary information in a timely manner.

The pillars which are important in the IT infrastructure to support the big data analytics are connectivity, compatibility, and modularity. Connectivity is the capability of attaining integration of various systems including customer relationship management, supply chain management, enterprise resource planning and databases. The compatibility can be described as a free flow of data and information whereas modularity is the possibility to add, change or delete technological units and software to the existing system when it is necessary.

iii. **Analytical Skills**

This aspect is ascribed to the skills that individuals who will be assigned to operate with the big data analytics programs ought to possess. These individuals should have professional skills and vast knowledge that would lead them to work to accomplish the required activities.

The skills and knowledge that a big data analyst must possess such as technical skills, knowledge in the management of technology, and business knowledge can be used to underscore analytical skills. Technical skills are those associated with the capability to use the system, knowledge of system languages, and information system design and development. Technology management knowledge is related to the management of information and communication technology resources. Business knowledge is the knowledge of the business units and organization structure.

3.2. Second Axis: Strategic Ambidexterity

a) The Concept of Strategic Ambidexterity

The topic of strategic ambidexterity has attracted the attention of numerous scholars and researchers in the sphere of strategic management. Strategic ambidexterity was first used by Duncan (1976) (Wu et al., 2020). This notion has become vital to business organizations in the environment of intense competition, turbulent changes in the environment, and the necessity to continue its presence in the market.

(Musigire et al., 2017) conceptualized strategic ambidexterity as the capability of an organization to engage in exploration as well as exploitation in the product and market space, strategic resources, and by instilling an environment that facilitates fast market responsiveness. Strategic ambidexterity is the capability of an organization to do two different things as good at the same time and have the ability to do them in a skillful manner which includes exploration, exploitation, integration, responsiveness, adaptability, alignment, efficiency and flexibility (Wu et al., 2020).

Strategic ambidexterity indicates the ability of an organization to synchronize and respond to the present business needs and react to the shifts in internal and external environments (Ahmadi et al., 2020). The main concept of strategic ambidexterity is that any organization, irrespective of its size and kind of activity, would have to find a balance between exploration and exploitation to emerge innovative and flexible (de la Lastra et al., 2017). March defines exploration as search, risk-taking, differentiation, flexibility, experimentation, discovery, and innovation and defines exploitation as selection, production, refinement, efficiency and execution (Jiang et al., 2022).

Both are essential yet conflicting practices that organizations need to implement to stay alive and prosper in the long run (Úbeda-García et al., 2020). March highlighted that companies must strike a balance concerning their focus on exploration and exploitation. Companies that focus on the exploration risk only might waste the resources on ideas which do not work or cannot be developed. On the other hand, organizations that aim at just exploiting may enhance their short-term performance, though they may not be the most successful since they may not be able to adapt appropriately to changes in the environment (Khan et al., 2020).

b) The Importance of Strategic Ambidexterity

The importance of strategic ambidexterity is reflected in several aspects, as highlighted by (Hussain et al., 2021) and (Gu et al., 2018):

i. It assists organizations to embark on exploration strategies that defeat stagnation as they have the vision that looks far into the future.
ii. It helps organizations to feel the prevailing opportunities and look into new market opportunities by utilizing their resources efficiently and finding their market.
iii. It helps organizations to learn the needs and requirements of customers, respond promptly and increase their capacity to attract potential customers.
iv. It assists organizations to improve the volume of sales and services offered to the employees through exploration and exploitation strategies, as well as addressing the needs of the current and new markets.

v. It also enables the organizations to launch new products without having adverse impacts on the current products in the markets operating in dynamic environments.

c) Dimensions of Strategic Ambidexterity

i. **Exploratory Ambidexterity:**

Exploratory strategy is exploration of new products, resources and knowledge. This approach is linked to drastic changes and learning by trial (Sinha, 2015). Exploratory ambidexterity means creating novel insights, going beyond existing technologies and capabilities, creating several meanings of available information, and looking at finding new solutions to problems. This will allow organizations to be able to adjust to a new environment and the new opportunities will lead to more business opportunities (Hassouneh et al., 2019).

ii. **Exploitative Ambidexterity:**

(Winker, 2021) defined exploitation regarding refinement, improvement, consistency, expertise, selection, production, efficiency and execution. (Gastaldi et al., 2022,) defined exploitation to use the available resources, enhancements, and greater efficiency in using knowledge and how organizations seek new opportunities. It means going out of the comfort zone by changing, taking risks and experimenting.

4. Section Three: Practical Aspect

4.1. First Axis: Description of the Main Study Variables

The paper provides a descriptive research of the key research variables, but with a particular focus on the independent variable, which is the Big Data Analytics Capabilities, and its sub-dimensions namely Data Analytics Management Capability, Information Technology Infrastructure, and Analytical Skills. It also discusses the dependent variable which is Strategic Ambidexterity and its dimensions which include Exploratory Ambidexterity and Exploitative Ambidexterity. The analysis is an attempt to pinpoint the nature, trends and patterns of these variables and thus provide a strong foundation on which the subsequent inferential and relational questions will be grounded.

a) Description of the Study Sample's Opinions on the Variable: Big Data Analytics Capabilities

On the general level, the data, provided in Table (3), that characterizes the capabilities of big data analytics, show that the mean of this variable is equal to 4.45, and its standard deviation reaches 0.666, which signifies a fairly consistent level of the opinions held by the sample considered the significance of this variable. The estimation of the coefficient of variation (14.98%) demonstrates a reasonable range of different points of view of respondents. The relative value of the variable (89%) indicates that the sample members attach much importance to big data analytics capabilities, which indicates that they are aware of its importance and central theme in the tourism and travel industry in Duhok city.

Table (3): Description of the Dimensions of the Big Data Analytics Capabilities Variable

Dimensions	Items	Arithmetic Means	Standard Deviations	Coefficient of Variation	Relative Importance
Data Analytics Management Capability	X1	4.48	.643	%14.35	%89.6
	X2	4.46	.642	%14.39	%89.2
	X3	4.44	.715	%16.10	%88.8
	X4	4.46	.642	%14.39	%89.2
	X5	4.46	.642	%14.39	%89.2
	Average	**4.46**	**.656**	**%14.71**	**%89.2**
Information Technology Infrastructure	X6	4.55	.592	13.01	%91
	X7	4.55	.557	%12.24	%91
	X8	4.50	.689	%15.31	%90
	X9	4.54	.626	%13.79	%90.8
	X10	4.47	.703	%15.72	%89.4
	Rate	**4.53**	**.633**	**%13.97**	**%90.6**
Analytical Skills	X11	4.46	.702	%15.74	%89.2
	X12	4.46	.642	%14.39	%89.2
	X13	4.47	.703	%15.73	%89.4
	X14	4.49	.718	%15.98	%89.8
	X15	4.49	.659	%14.67	%89.8
	Rate	**4.47**	**.684**	**%15.30**	**%89.4**
Overall Mean of Big Data Analytics Capabilities		**4.45**	**.666**	**14.98%**	**89%**

Source: elaborated by authors depending on the SPSS outputs.

On the sub-level, Table (3), summarizing the dimensions of big data analytics capabilities, shows that the Information Technology Infrastructure dimension is the first followed by high arithmetic mean of 4.53, standard deviation of 0.633 and significant uniformity in the opinions as indicated by the coefficient of variation (13.97%). The next dimension is Analytical Skills, whose arithmetic mean is 4.47 and the level of relative importance is high.

The Data Analytics Management Capability dimension has been ranked last, and it has an arithmetic mean of 4.46, a standard deviation of 0.656, and a coefficient of variation of 14.71% indicating a relative weakness on the effectiveness of data analytics management mechanisms over the other dimensions of big data analytics capabilities. Although this was rated as high in

relative importance (89.2%), this shows a significant difference in the competencies of the respondents in terms of their skills in managing data analytics and clearly shows how difficult it was in areas concerning how to work with data analytics technologies. This shows how urgently there is a need to improve this aspect to make them more data analytics management proficiency and more familiar with the latest analytical tools.

b) Description of the Study Sample's Opinions on the Variable: Strategic Ambidexterity

The descriptive findings that could be obtained in Table (4) show that the Strategic Ambidexterity variable had an arithmetic mean of 4.32 and a standard deviation of 0.687, which is relatively indicating that the respondents were fairly consistent in their ratings. The value of the mean coefficient of variation (15.80) shows that there is an intermediate dispersion in the answers. The comparative significance of the total variable (88.2) indicates that the sample of the study evaluated the strategic ambidexterity of the organizations under investigation on a very high level. This means that the respondents believe their organizations have strong strategic capabilities, in as far as the overall strategic ambidexterity is concerned.

Table (4): Description of the Dimensions of the Strategic Ambidexterity Variable

Dimensions	Items	Arithmetic Mean	Standard Deviation	Coefficient of Variation	Relative Importance
Exploratory Strategy	Y1	4.18	.795	19.14%	%83.6
	Y2	4.31	.775	17.98%	%86.2
	Y3	4.20	.725	17.26%	%84
	Y4	3.90	.893	22.90%	%78
	Y5	4.30	.718	16.70%	%86
	Rate	**4.17**	**.781**	**18.73%**	**%83.56**
Exploitative Strategy	Y6	4.45	.702	15.78%	%89
	Y7	4.49	.595	13.25%	%89.8
	Y8	4.34	.670	15.44%	%86.8
	Y9	4.38	.599	13.67%	%87.6
	Y10	4.45	.626	14.06%	%89
	Rate	**4.42**	**.638**	**14.44%**	**%88.4**
Overall Mean of Strategic Ambidexterity		**4.32**	**687.**	**%15.80**	**%88.2**

Source: elaborated by authors depending on the SPSS outputs.

Table 4 that provides the dimensions of strategic ambidexterity shows that the arithmetic mean of the sub-dimensions is 4.42. This value is supported by a relatively low standard deviation of 0.638, a coefficient of variation of 14.44 and a large relative importance of 88.8, thus it can be seen that there is a strong consensus among the data points. These statistical measures highlight the extent to which there is a level of consensus between the respondents on both the weighting of this sub-dimension and the embodiment of this sub-dimension of the overall construct of strategic ambidexterity. The resulting consistency signifies that the sub-dimension is a well-recognized critical aspect of strategic ambidexterity in the situation that is being analyzed.

However, the Exploratory Strategy dimension scored rather lower, where the arithmetic mean is 4.17, the standard deviation is greater 0.781, the coefficient of variation is 18.73, and the relative importance is 83.56. Nevertheless, it remains in the very high evaluation range, which implies that the study sample is aware of the significance of pursuing opportunities and service areas that have not been explored by competitors. The difference in responses could possibly be explained by the flaws in the adoption of this strategy by the management of the investigated organizations, yet it cannot decrease the significance of the strategy discussed as one of the keys to strategic ambidexterity.

c) Testing the Research Hypotheses

Testing the Correlation Hypothesis: The test of the first main hypothesis, which refers to the correlation between the independent and dependent variables both at the overall and sub-dimension level in the investigated organizations, is as follows:

Correlation Hypothesis at the Overall Level: The first main hypothesis of the study states: *"There is a statistically significant correlation between big data analytics capabilities and strategic ambidexterity in the investigated organizations."*

Table (5): Results of Testing the Main Correlation Hypothesis

Hypotheses	Original Sample	Standard Deviation	T statistics	P-Value	Sig.	Decision
Data Analytics Management Capability > Strategic Ambidexterity	0.698**	0.134	29.480	0.000	Significant	accepted
Information Technology Infrastructure > Strategic Ambidexterity	0.779**	0.127	29.480	0.000	Significant	accepted
Analytical Skills > Strategic Ambidexterity	0.733**	0.098	27.523	0.000	Significant	accepted

Source: elaborated by authors depending on the SPSS outputs

The findings of the main correlation hypothesis between the big data analytics capability and the strategic ambidexterity, as presented in Table (5), show that there is a strong positive correlation. The correlation coefficient was about 0.859 and it indicates that the relationship between the two variables was strong and significant. The value of t-test was about 22.183 that is significantly greater than the tabular t-value of 1.974 at the significance level of 0.05 with degree of freedom 152, that shows that the correlation is statistically significant. Also, the p-value was 0.000 which is less than 0.05 which validates the conclusion. As a result, the hypothesis on statistically significant relationship was accepted between big data analytics capabilities and strategic ambidexterity. This contributes to the significance of big data analytics potentials in contributing to strategic ambidexterity among the research organizations.

Testing the Correlation Hypothesis at the Sub-Dimension Level: The sub-hypothesis of the first main hypothesis states: *"There is a statistically significant correlation between big data analytics capabilities and strategic ambidexterity."*

The correlation analysis results of testing the correlation between the dimensions of big data analytics capabilities and strategic ambidexterity at the sub-dimension level as illustrated in Table (6) reveal that all dimensions of big data analytics capabilities have a strong correlation and statistically significant correlation at the 0.05 level of significance with strategic ambidexterity. The findings indicate that the Information Technology Infrastructure dimension was ranked highest to be partially correlated with strategic ambidexterity (0.779) with t-value of 29.480 and then the Analytical Skills dimension with a correlation coefficient of 0.733 and a t-value of 27.523. The least correlation was noted in the dimension of Data Analytics Management Capability with the correlation coefficient of 0.698 with the t-value of 29.480.

These results imply that all the sub-hypotheses were accepted and statistically significant, which means that each of the individual dimensions of big data analytics capabilities played a role in the improvement of strategic ambidexterity. In particular, the findings indicate that the elements of data acquisition, data processing, data storage and advanced analytics have effectively reinforced and reinforced each other positively and negatively the power of the organizations to respond to the market changes in a quick and efficient manner. This positive effect was consistently captured in the study sample which consisted of employees in the researched organizations in the city of Duhok in relation to various levels of organizational roles and duties. It means that the investment in the infrastructure of a big data, in human resources, and tools of analysis can contribute directly to the creation of strategic ambidexterity through the faster time to decision, the effectiveness of operations, and the ability to respond to a new opportunity and threat proactively. Thus, the evidence highlights the pragmatic importance of big data analytics to be one of the primary agents of increasing organizational ambidexterity of strategy and performance.

Table (6): Partial Correlation Coefficients

Correlations	Original Sample	Standard Deviation	T-statistics	P-Value	Sig	Decision
Big Data Analytics Capabilities > Strategic Ambidexterity	**0.859**	**0.343**	**22.183**	**0.000**	**Significant**	**Hypothesis Confirmed**

Source: elaborated by authors depending on the SPSS outputs

Testing the Impact Hypothesis: This part outlines the impact hypothesis test at the overall and sub-dimension of big data analytics capabilities on strategic ambidexterity in the organizations under study.

i. **Impact Hypothesis at the Overall Level:** The second hypothesis of the research is as follows: The statistically significant effectiveness of the big data analytics capabilities on the strategic ambidexterity of the studied organizations.

The findings of the overall impact hypothesis test, obtained in Table (7) and Figure (2), demonstrate the fact that big data analytics capabilities have a great influence on strategic ambidexterity. The independent variable of big data analytics capabilities had a beta coefficient of 0.812, which is considered as a positive and significant impact on the dependent variable of strategic ambidexterity. The correlation was 0.69, which indicates that the strategic ambidexterity variance was resolvable through the use of big data analytics by 69 percent. This means that the more the big data analytics capabilities that the study sample has, the more they are in a position to handle and analyze their data, resulting in a better comprehension of the movements and actions of the competitors.

The tabular F-value of 6.900 at a significance of 0.01 and degrees of freedom (1, 99) is much lower than the calculated F-value of 225.895, and therefore the statistical significance is high. Moreover, significance value (Sig) was 0.000, which justified the validity of the second hypothesis of the main hypotheses. Therefore, the assumption that the capabilities of big data analytics have a statistically significant effect on strategic ambidexterity were tested was proven correct.

Table (7): Results of the Overall Impact Coefficient

Model	Big Data Analytics Capabilities					Hypothesis Outcome
	Beta Coefficient (β)	R2	F-Value	Tabular F-Value	Sig	
Intercept B0	0.834	-	-	-		accepted
Strategic ambidexterity B1	0.812	0.69	225.895	6.900	0.000	
Degrees of Freedom (1, 99)		Sig. ≤ 0.01		N=100		

Source: elaborated by authors depending on the SPSS outputs

ii. **Impact Hypothesis at the Sub-Dimension**

The results of the sub-dimension impact analysis of big data analytics capabilities on strategic ambidexterity, presented in **Table (8)**, indicate that all relationships were significant at the 0.05 level, confirming the validation of all sub-hypotheses. The impact coefficient of **Data Analytics Management Capability** on strategic ambidexterity was **0.594**, with a **T-value** of **10.496** and a **P-value** of **0.000**, indicating a clear significant effect. **Information Technology Infrastructure** recorded the highest relative impact among the sub-dimensions, with a coefficient of **0.673** and a **T-value** of **10.653**. **Analytical Skills** demonstrated a strong impact of **0.632**, supported by a **T-value** of **12.289**.

These results indicate that all sub-dimensions of big data analytics capabilities significantly contribute to enhancing strategic ambidexterity in the studied organizations. This is particularly essential for business organizations, especially travel companies, which rely heavily on big data analytics capabilities to achieve operational excellence, identify and exploit market opportunities, respond flexibly to changing customer requests regarding ticket bookings and travel destinations, and monitor and anticipate competitors' future behaviors.

Table (8): Sub-Dimension Impact Coefficient Results

Sub-Hypotheses:	Coefficient of Effect	Standard. Deviation	T. Value	P. Value	Significance Level (0.05)	Hypothesis Status
• **Data Analytics Management Capability → Strategic ambidexterity**	0.594	0.258	10.496	**0.000**	**Significant**	**accepted**
• **Information Technology Infrastructure → Strategic ambidexterity**	0.673	0.278	10.653	0.000	**Significant**	**accepted**
• **Analytical Skills → Strategic ambidexterity**	0.632	0.229	12.289	0.000	**Significant**	**accepted**

Source: elaborated by authors depending on the SPSS outputs

5. Conclusions and Recommendations

5.1. First: Conclusions

a) Consciousness of the Big Data Analytics Capabilities (BDAC): The empirical results of the current study prove that there is a strong level of awareness of the workforce regarding the importance of the Big Data Analytics Capabilities (BDAC). The overall average of 4.45 with a relative importance position of 89, is a testimony of a substantive orientation towards an ethos of data involved in the travel and tourism industry in Duhok. The cognitive maturation of the employees observed is an indication of a changing perception of the

strategic value of data analytics in supporting informed decision-making. The increased awareness is not only indicative of an understanding of the technical aspects of the data analysis but also includes a sense of the greater strategic importance of the process, including improving organizational performance, operational optimization, and gaining competitive advantage. Also, this increased awareness has become a critical organizational change, in which digital and analytical paradigms are being embraced as core components of the business processes and competitiveness. It highlights the readiness of staff members to interact with advanced data analytics solutions, to integrate data insights into the daily decision-making process, and to add to the evidence-based strategies that make sense in terms of long-term organizational goals. It is this course that will bring these enterprises into the transformational path in terms of leaving traditional decision making models behind and moving on to digitally analysis, and strategically informed working model.

b) The first dimension was the Information Technology Infrastructure (mean 4.53, relative importance 90.6%), which is the technical power of the surveyed organizations, successful technology investment, availability of systems and software that can support data collection, storage and processing. The organizations are also well endowed in terms of the technical base which can be tapped to increase the analytical capacity.

c) The dimension of Data Analysis Management Capability was comparatively the last (mean 4.46, relative importance 89.2%), which is a weakness of analytical management. Although the technical infrastructure is high, the poor management depicts the disparity between technological facilities and administrative capacities in applying them; in other words, there is technology, but its strategic implementation does not exist.

d) The dependent variable, strategic ambidexterity, had a high level (mean 4.32, relative importance 88.2%), which means that a high extent of organizational flexibility and the capacity to adapt to changes in the environment can be observed in the travel and tourism firms in Duhok.

e) The exploitative strategy scored the highest with the mean 4.42 and relative importance 88.4% relative to the exploratory strategy (mean 4.17, relative importance 83.56%). This shows that firms are more likely to use the available resources and enhance current operations rather than expanding into new markets or products when exploring new markets or products.

f) Correlation coefficient between BDAC and strategic ambidexterity was significant (0.859) and statistically significant which affirms that there is meaning correlation between having data analysis capabilities and high level of strategic ambidexterity. Such sophisticated data analysis has now become one of the key instruments of carrying out exploration and exploitation strategies and striking a balance between them.

g) The highest partial correlation with strategic ambidexterity was found in the Information technology infrastructure dimension (0.779), indicating that good technical infrastructure is the most important factor in facilitating the ambidexterity of an organization. The infrastructure promotes prompt and precise data transfers that support the leaders to make the right decision at the right time.

h) The dimension of Analytical Skills had a definite positive influence on the improvement of strategic ambidexterity, and the coefficient of the effect was 0.632. This implies that personal abilities in data analysis are converted into organizational adaptability and the capability to make decisions that are flexible.

i) To some degree, there is a relative lack of adhering to the exploratory strategy despite its value in determining the opportunities in the market. The travel and tourism businesses in Duhok are more inclined to exploitative business models like enhancing performance and leveraging existing resources, but they do not pay significant attention or only pay minimal attention to the investigation practices like experimenting with new business techniques, exploring new innovative markets, and adapting the modern and data-driven business models. This shortage does not mean the absence of the desire to innovate but the inability of the organization, culture, and managers to fully involve themselves in the exploratory strategies, which are fixed by their constraints. The problems that local travel and tourism companies are likely to encounter are:

- Scarcity of funds on new or trial projects,
- Poor developed analytical skills to determine future opportunities properly,

- A competitive milieu where it is easier to copy what has worked than to develop innovation,
- An organizational culture which values quick sure returns over investment in uncertain results.

6.2. Second: Recommendations and Implementation Mechanisms

i. Initiate a reward system to invest by travel and tourism companies in creation of a wholesome Big Data analytical platform.
ii. Implementation mechanism: Have a yearly budget on the implementation and up gradation of analytical infrastructures and have systematically training programs to maximize the use of superior analytical tools by the staff.
iii. Invest and develop technological infrastructure in the industry. Mechanism of implementation: Introduce planned maintenance practices of vital infrastructure and redirect resources into the use of artificial intelligence and cloud-based computing.
iv. Develop analytical management skills among the employees in the travel and tourism industry.
v. Mechanism of implementation: Design specific training programs on the topic of Big Data governance and streamline them towards strategic decision-making models.
vi. Constantly strengthen the strategic competencies of the travel and tourism businesses. Implementation mechanism: Hold frequent workshops with the senior management teams to look at mechanisms of strategic adaptation in relation to market dynamics.
vii. Couple the focus on exploration strategies with the exploitative initiatives to attain a balanced path. Mechanism of implementation: Have special innovation departments in the corporations to come up with new ideas and explore new untapped opportunities.
viii. Make Big Data analysis one of the pillars of strategic planning processes. Implementation mechanism: Incorporate results of analytics into the strategic planning cycles and connect key performance indicators to predictive analytics models.
ix. Increase dependency on smart systems to speed up responsiveness to the strategy. Implementation mechanism: Invest in integrated enterprise resource planning systems with technology of artificial intelligence and predictive analytics.
x. Integrate the use of advanced analytics and artificial intelligence in academic and professional training of the staff. Mechanism of implementation: relate these advanced competencies to both decision-making practices and organizational processes.
xi. Stimulate the surveyed organizations to go innovative and venture into new market segments. Implementation mechanism: Introduce internal start-up programs and establish collaborations with the start-ups within the travel and tourism industry.

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