

# Role of Analytics in Shaping the Supply Chain Industry in the Middle East

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## Abstract

*Big data analytics (BDA) is among the most digital innovations for supporting source chain firms' pursuits. Empirically, several advantages of BDA found in supply chain management (SCM) are shown. The study aimed to explore the connection between specialized, organizational and environmental elements, the efficiency of supply chain firms with the technology-organization-environment (TOE) framework and the diffusion of innovation (DOI) principle. This study was done at medium large source chain companies within Turkey. The test dimensions hit 450 companies realized by Turkey's Ministry of Industry and Commerce in various domains. In this research, a questionnaire was used to collect the main information. The collected data are examined using SPSS model 26.0. SPSS is used to describe respondents' market profiles. The portion of respondents to the questionnaire reached 57%. Additionally, to evaluate hypotheses and achieve investigate objectives, PLS-SEM model 3.0 is utilized to analyze the relationship between dependent and independent variables. From the PLS benefits, the study found that intricacy had been positively associated with the firm's efficiency. However, family member advantage, compatibility had been badly associated with the firm's efficiency.*

**Key terms:** supply chain, Middle East, analytics

**JEL Classification:** M21, R40

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## 1. Introduction

Turkey has established objectives for 2020, along with a strategic eyesight for 2030, focusing on strategies and supply chain control. Among the main objectives of these techniques is diversifying the country's financial streams from petroleum (Antons & Breidbach, 2018). In Turkey, BDA solutions will be among the main facilitators because of the achievements of Vision 2030, as information will drive the Kingdom's formula for the long term, creating new possibilities, growing the economic system and transforming culture, which are crucial goals on the Turkey Vision 2030. Another goal is to increase investments and lead the digital economy through technology (Gunasekaran *et al.*, 2017). The Turkey government is also searching for private sector collaborations to develop info technology infrastructure and telecommunications. Implementation of BDA might be tricky because of the higher cost, complexities, liabilities and applicability associated with modern technological innovation. These elements may well add to ambiguity in the decision to execute BDA in SCM activities.

Turkey's constantly changing green patterns, mainly due to the Vision 2030 setup, along with other unforeseen circumstances like the COVID-19 pandemic, could cause Turkey companies to reevaluate their choices, possibly leading them to follow BDA to experience, and get an industry leader. Furthermore, big data helps firms to improve their supplier evaluations and govern procurement tasks in any circumstance. Companies might also simulate their supply networks using big data (Jahan & Sazu, 2022b). While several researches have shown the benefits of using BDA in SCM, investigation in developing economies is restricted. Much of the prior research focused on rich industrialized countries. In contrast, several prior published researches have examined Turkey's drive to follow and use huge data analytics know-how to SC companies. Moreover, Isenberg *et al.* (2022) suggest increasing applications of BD solutions and approaches in numerous aspects of SCM, like prediction, cash flow management, as well as risk assessment. Nevertheless, many CEOs still don't use great data analytics in their decision-making activities (Kayser *et al.*, 2018).

The expected test size reaches near 450 companies realized by the Ministry of Industry and Commerce in Turkey in various domains. Thus, the findings of the research will provide generalization understanding and find out the primary factors facing firms to follow great details through testing the adoption associated with a huge information type in firms. Moreover, this study is crucial, as it plays a role in growing the literature on SCM and BDA in Turkey. Furthermore, it may be used as a guide for coming academics seeking to grow their study focus on factors impacting the adoption of big information solutions in the Middle East nations.

## 2. Literature review

A supply chain is a system of suppliers, retailers, warehouses, transportation companies, manufacturers and buyers. Supply chain management seeks to manage the motion of finances, info, along with foods inside a supply chain to keep high levels of item availability, in addition to assistance on the consumer in probably the lowest feasible price (Sazu & Jahan, 2022a). These days, there are a plethora of records produced due to transactions between purchasers and suppliers, the use of big data techniques and strategies in various supply chain management themes or templates, including forecasting, earnings managing, as well as risk analysis, utilizing case studies from top brands. Nevertheless, despite the increasing use of big information in deep supply chain management, several supervisors continue to avoid incorporating big data analytics to their decision-making processes.

### ■ Big data analytics adoption

The term "big data" describes an enormous dataset that can't be controlled or even analyzed using typical databases. In contrast, other industry experts saw large data as a company approach, which enables organizations to look at simply an enormous volume of data (Zhu *et al.*, 2019). Additionally, BDA is an alternative approach for handling, processing, analyzing information of different sizes of volume, bunch, velocity, veracity and then value necessary to offer actionable info for sustained distribution, performance evaluation, along with competitive benefit.

In general, huge data adoption has an influence on SCM effectiveness in several aspects and also it's displayed in numerous studies. Nevertheless, Sazu & Jahan (2022b) observed that the latest research asserted that many companies are incapable of leveraging worth from the leads that BDA might offer their businesses. Several academics have rejected that companies might improve their performance through BDA. As an outcome, there might be an absence of understanding, conflicting views about how firms could profit from BDA money. Furthermore, the guarantees of BDA aren't extensively examined by companies like SCM businesses.

BDA's apps have contributed to the enhancement and advancement of several business models, like supply chain management. Countless previous reports and publications had found BDA adoption advantages, such as increased danger reduction, need forecasting, batch size, inventory reduction, as well as the improvement of much more innovative solutions to enhance the pleasure of customers. Regardless of these advantages, various other researchers state that many businesses are reluctant to recognize and use BDA engineering, necessitating empirical searching to determine the variables which affect and modify enterprises' inspiration to adopt and use BDA.

### ■ Big data analytics, as well as provision of chain performance

Many companies in different industries work with big data analytics technology to control risks, lower operating expenses and boost supply chain exposure and traceability. Based on Li & Zhang (2021), BD is a great tool to assist businesses in conducting analyses. According to Sazu & Jahan (2022b), accessibility of considerable amounts of information could play a crucial role in producing insights to decision-making processes. Sazu & Jahan (2022c) think that big data technology enhances the functionality of supply chain businesses. Many earlier studies conducted on the apps of big data analytics technologies showed the possibility of using the technologies in numerous sectors (Hao *et al.*, 2019). Regardless of the buzz around the adoption of serious information, none of the experiments was examined in depth, especially in a medium-sized enterprise. Nevertheless, in terms of the connection between the most emphasized elements for big data adoption examined in a certain scenario, Zhuang *et al.* (2021) suggested it by using big samples and concentrating on mixed method techniques. To create and validate present theoretical versions and ensure accuracy for future scientific studies, a detailed and in-depth analysis is required.

Supply chain analytics isn't a new thought. Historically, supply chain management has trusted data and activities investigation to enhance supply and demand matching goals (Ayed *et al.*, 2015). With all the assistance of an info system, business analytics has a strong connection with supply chain efficiency. Nevertheless, the growth of large data uses in deep supply chain management does start new possibilities. Supply chain analytics is a generic term which describes innovative big data analytics employed in controlling the supply chain. These analyses could be classified as predictive, descriptive or perhaps prescriptive. Several benefits of BDA found that SCM is dependent on empirical investigation, such as cost reductions, improved SC flexibility and happy clients. As a result, there's growing interest in defining unique skills for SCM information scientists. Big data analytics is quickly gaining traction among academics and it is becoming a high priority for small businesses to deploy. Every day, incomprehensible quantities of information are moved and collected as an outcome of the prevalent use, as well as the development of large data enabling resources like identification technologies, mobile devices and social networks that provide consent to the Internet of Things. Since improved information equates to improved expertise, companies frequently use these solutions to create and protect a naturally competitive benefit.

### ■ Underpinning theory

A theoretical model is a set of preexisting, approved hypotheses taken out of the academic literature. The technology group environment (TOE) framework used as the primary underpinning of the study's diffusion and the theory of innovative development (DOI) (Jahan & Sazu, 2022a) are several commonly utilized information methods (IS) adoption theories for examining organizational or individual IT adoption choices. Many scholars have confirmed and tested these hypotheses in several adoption situations, healthcare, e-learning, including e-commerce and tourism (Nguyen *et al.*, 2018). They play a crucial role in thinking about the points that affect some technology acceptance choice by producing a blueprint. They must be deemed to resolve great details approval, delivery problems in the individual or organizational fitness level. Many factors impact major data adoption, such as IT complexity, usefulness and infrastructure.

To conclude, a literature survey suggests that big data analytics is the procedure by which an innovation changes the structure of a company. Large data adoption includes improved info processing methods, as well as technological advancements that support decision-making. It provides organizations different opportunities to use info and get a competitive advantage. The use of big data enhances chance prediction, boosts generation, and effectively satisfies clients. Additionally, big data usage will help sectors and businesses outperform their rivals (Verma & Singh, 2017). Thus, big data use might be expensive and time-consuming, though the long-term advantages might lead to success.

While great details have often been employed in predictive investigation, there are fairly few scientific studies measuring prediction error in big information (Liu, 2014). Much more precisely, above the quality of the raw data, the reliability of big data evaluation is clearly affected by the unit utilized to analyze the information. We still have an extended way to go in terms of generating metrics that may be utilized to look at the accuracy

of a way for analyzing big data (Silva *et al.*, 2020). The bulk of existing exploration on large data uses in deep supply chain management is conceptual and theoretical, with a unique dearth of investigation on analytical versions. Furthermore, existing analytical versions focus primarily on the use of big data in modeling sustainability. As a result, there's still a gap in the use of big information to supply chain (Sazu & Jahan, 2022c). Although empirical studies have examined factors influencing BD adoption in various aspects, the previous literature shows a lack of empirical proof for big information adaptation within Turkey. As a result, this analysis will focus on medium large supply chain businesses in Turkey to handle this absence from the literature.

### 3. Aims and hypotheses

This analysis seeks to examine the connection between specialized, organizational, as well as green factors, and also SCM effectiveness at medium large source chain companies in Turkey.

Three hypotheses were developed as follows:

- ✓ H1: *Relative benefit is positively associated with supply chain management efficiency at Turkey companies.*
- ✓ H2: *Complexity is favorably associated with supply chain management efficiency at Turkey companies.*
- ✓ H3: *Compatibility is favorably associated with supply chain management efficiency at Turkey companies.*

### 4. Method

This study was done at medium large source chain companies within Turkey. The test dimensions hit to 450 firms realized by Turkey's Ministry of Industry and Commerce in various domains (such as airlines, banks, broadcasting & entertainment, building fixtures and materials, business assistance services, production and exploration, food items, food merchants & wholesale suppliers, general mining, heavy building, insurance, investment services, marine conveyance, publishing, railroad, real estate keeping & advancement, restaurants, specialty chemical substances), different locations and telecommunications (such as Riyadh, Jubail, Jeddah, Dhahran, Dammam, Khobar). The study included specific workers at different levels inside their organizations, like proprietors, senior control, center management, info technology expertise, as well as staff members. The study sample even incorporated many departments at supply chain companies, for example, procurement, operations, import/export, expediting, buying, inventory and logistics. The study population was put together by two main sources. A business directory posted by Turkey's Ministry of Industry and Commerce is the first source. The other source population for the analysis was produced from a Turkey business directory which provided solid names, fax numbers, phone numbers and site back links to broaden the target public.

To achieve the study's goals, a quantitative strategy was used. In this research, a questionnaire was used to obtain the main details. The respondents were asked to reply to the things provided in a questionnaire. The researchers conducted both hard-copy and online styles to distribute these questionnaires on the respondents within three weeks in the main urban areas of Turkey. The survey identified the market profile and included five variables – current place of workers, organization area, business sizing by annual revenue, business size by workers and organization expertise around the company. Based on the survey's results, the portion of workers who answered the questionnaire were employees in CIO/IT director/Technology director, and their portion hit approximately 77.1%. Additionally, nearly all the businesses that answered the questionnaire were businesses employed in transport/logistics/post, as their portion reached 31.3%. Furthermore, the portion of responding businesses in terminology of yearly revenues (85,150 million SAR) attained 52.1%. In the long run, the responding businesses welcomed the employees size selection (50,100 employees) (63.2%).

The questionnaire was divided into two sections – elements of adoption and firm performance. The factors of adoption include three major variables: relative benefit, compatibility and complexity. The questionnaire's measuring products have been almost all scored holding a Likert scale, with a selection of one (strongly disagree) to five (strongly agree).

Probably the pretest was carried out using specialist judgments, because the questionnaire in this study was made up of measurements from different scenarios. As an outcome, the questionnaire was modified depending on the guidance of three pros to guarantee the validity and reliability of the scales (Shakya & Smys, 2021). The

expert’s identity has been withheld to stick to the expert’s confidentiality obligations. A pilot examination with hundreds of responders from among the SCM companies bundled in this analysis can also be done. Most indications use a Cronbach’s alpha benefit in excess of 0.70. Specialized Contexts  $\alpha = 0.862$ ; Organizational Contexts  $\alpha = 0.881$ ; Environmental Contexts  $\alpha = 0.910$ ; and Firm Performance  $\alpha = 0.915$ , indicating enough inner consistency.

The collected information is analyzed using the Statistical Package of Social Science (SPSS) strategies via SPSS application model 26.0. SPSS is used to refer to respondents’ market profiles, report descriptive figures and Partial Least Squares Structural Equation Modelling (PLS-SEM) strategies via SmartPLS application model 3.0. PLS-SEM is used to explore the connection between dependent and independent variables to confirm hypotheses and realize the objectives of the investigation.

## 5. Results

The measurement design was evaluated by evaluating validity, composite reliability and outer loadings, Cronbach’s alpha ( $\alpha$ ), typical variance extracted (AVE), as well as component loadings, as found in Table 1. All the constructs had Cronbach’s alpha ( $\alpha$  CR and) in excess of 0.70, meeting construct dependability requirements. Most typical variance extracted (AVE) values were far more substantial than 0.50, fulfilling convergent validity requirements. And also the aspect loadings, in excess of 0.70.

Table 1. Results: Cronbach’s alpha, CR and AVE

Latent variables	Indicators	Factor loadings	Cronbach’s alpha	CR	AVE
Relative benefit	TR1	0.80	0.88	0.92	0.76
	TR2	0.80			
	TR3	0.86			
	TR4	0.86			
Complexity	TCM1	0.79	0.72	0.88	0.53
	TCM2	0.70			
	TCM3	0.74			
	TCM4	0.87			
Compatibility	TOP1	0.73	0.76	0.87	0.69
	TOP2	0.76			
	TOP3	0.83			
	TOP4	0.73			

The structural item was evaluated by evaluating collinearity statistics (VIF), coefficient of dedication (R<sup>2</sup>), road coefficients ( $\beta$ ), impact size (f<sup>2</sup>), as well as predictive importance (Q<sup>2</sup>). The VIF values were under 5, confirming collinearity. Moreover, the path coefficients and complete effects were analyzed. Predictive importance (Q<sup>2</sup>) values were even greater compared to zero, indicating that the estimated design was predictive.

Table 1 shows the end result, indicating the benefits of the road coefficient are tested utilizing p-value evaluation and t-statistics in the 05,01, plus 001 confidence interval amounts.

Table 2 reveals the structural style estimates of the hypothesized human relationships, both indirect and direct consequences. The immediate consequence of the relative edge on firm efficiency is negatively and statistically minor ( $\beta = -0.005$ , p-value = 0.842, t = 0.200), **not supporting hypothesis H1**. The immediate impact of intricacy on tight efficiency is statistically considerable ( $\beta = 0.096$ , p-value = 0.004, t = 2.817), **supporting H2**. The immediate impact of compatibility on tight efficiency is statistically minor ( $\beta = -0.021$ , p-value = 0.704, t = 0.314), **not supporting H3**.

Table 2. Path coefficient of variables

H	Paths	$\beta$	t-statistics	p-values	Support
H1	Relative benefit → Firm performance	-0.005	0.200	0.842	No
H2	Complexity → Firm performance	0.096	2.817	0.004	Yes
H3	Compatibility → Firm performance	-0.021	0.314	0.704	No

## 6. Discussion of the connection between technical SCM and contexts performance

This section discusses how you can evaluate hypotheses H1, H2 and H3.

*H1: Relative benefit is positively associated with supply chain management efficiency at Turkey companies.*

The information analysis benefits didn't support H1, implying that there's absolutely no connection between distant relative business and advantage efficiency. The study's results on the link between distant relative business and advantage performance are much less substantial in the environment of big data adoption. Sazu & Jahan (2022a) found absolutely no proof for relative benefit of reports of big data adoption, hinting that the family member benefit might be redundant in this kind of investigation. Nevertheless, the absence of awareness of how large data analytics technology might be utilized to improve performance of an organization can have a negative impact on adoption compared to the very first idea. A business employee believes that big data analytics technology provides several benefits, including enhancing the firm's efficiency. The benefits of big data analytics are therefore readily apparent to businesspeople and staff.

*H2: The complexity of supply chain management in Turkey firms positively correlates with their performance.*

Findings on the effect of complexity on business performance revealed a good link supporting H2. This study found that complexity had a good connection with the success of the company. While prior research has shown that complexity has a negative impact on BDA acceptance, several studies have shown that complexity doesn't impact BDA or any other IT innovation adoption. The complexity, on the other hand, is mainly determined by people who will interact with engineering, because descriptive demographics found that nearly all respondents (72.1%) are specialized in info technology. Thus, users will not have any difficulty using this technology, as it is so easy to learn, understand and use, and it's clear as well as easy to understand.

*H3: The compatibility of Turkey companies in terms of supply chain management is positively associated with performance.*

A comparative analysis of the data shows an undesirable correlation between compatibility and business results. The infrastructure compatibility negatively affects the firm's performance for embracing big data analytics techniques. H3 is therefore not supported. Previous research has demonstrated an irrelevance of compatibility with BDA adoption. Additionally, the managers' decisions about BDA adoption are affected by compatibility. The business will be more open to utilize BDA technology in many areas of supply chain activities if they believe it is in line with the data acquired, existing operating procedures, its infrastructure, as well as business values and beliefs.

## 7. Conclusions and future research

The aim of this research was to examine the relationship between SCM success at medium-large supply chain companies in Turkey and environmental, organizational and technical factors. The PLS results could have two crucial implications. Complexity, protection, IT expertise, along with outside support factors first show their good impact on BDA adoption, which boosts firm performance. Comparative benefit, compatibility, top management assistance, organizational resources, competitive pressure, as well as privacy facets have negatively affected the adoption of BDA, lowering firm performance.

The report recommends companies to prioritize spreading and boosting awareness of the main benefits of BDA technology to other stakeholders within the organization. Firms also need to consider the difficulties of using BDA technology, along with additional factors that could influence acceptance, such as resistance to change, information quality, as well as integration, organizational learning culture, decision-making culture. Firms are also obliged to design appropriate strategies to conquer these difficulties throughout the planning phases of the deployment of technology.

Future research studies need to include the proposed paradigm for the adoption of big data analytics technologies, along with other concepts including resource-based view, total addressable market and trade and transport facilitation. The framework's ability to describe previously unknown elements of big data analytics technology adoption and use could be increased by integrating a more theory-based context. The study was ultimately limited to small Turkey supply chain organizations. To generalize the results of the study to the Turkey sector, a framework would be required to analyze small to medium sized companies in Turkey.

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