






## Article

# Towards the Achievement of Frugal Innovation: Exploring Major Antecedents among SMEs

Abdelmohsen A. Nassani <sup>1</sup>, Crenguta Sinisi <sup>2</sup>, Daniela Mihai <sup>2</sup>, Loredana Paunescu <sup>3</sup>, Zahid Yousaf <sup>4,\*</sup>  
and Mohamed Haffar <sup>5</sup>

<sup>1</sup> Department of Management, College of Business Administration, King Saud University, P.O. Box 71115, Riyadh 11587, Saudi Arabia; nassani@ksu.edu.sa

<sup>2</sup> Department of Management and Business Administration, University of Pitesti, 110040 Pitesti, Romania; crengutaileana77@gmail.com (C.S.); daniela.mihai@upit.ro (D.M.)

<sup>3</sup> Department of Cybernetics, University of Petrol & Gas, 100680 Ploiesti, Romania; loredana.paunescu@yahoo.com

<sup>4</sup> Higher Education Department, Government College of Management Sciences, Mansehra 23100, Pakistan

<sup>5</sup> Department of Management, Birmingham Business School, Birmingham B15 2TY, UK; m.haffar@bham.ac.uk

\* Correspondence: muhammadzahid.yusuf@gmail.com

**Abstract:** The study in hand investigates the impact of the Internet of things (IoT) and digital platforms on frugal innovation. Furthermore, we also tested the intervening role of digital platforms and moderating role of organizational readiness. Data were collected from SMEs and the collected data were analyzed with various statistical techniques. Findings shown that the IoT positively affects digital platforms and frugal innovation. Results proved that digital platforms mediate the association between the IoT and frugal innovation. Furthermore, organizational readiness also moderates on the association between digital platforms and frugal innovation. The findings revealed that only those businesses that update their business operations according to the needs of their customers can achieve success. Frugal innovation is an emerging concept, and its achievement is a very tricky and complex task. This study shows that only those businesses that update their business operations using the IoT and digital platforms can achieve success. Moreover, modern SMEs should be able to adapt to the required changes in their business activities. Hence, SMEs also require some strategic changes in their operations in order to cope with changing business circumstances.

**Keywords:** Internet of things; digital platforms; organizational readiness; frugal innovation; SMEs



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## 1. Introduction

The emergence of digitalization and innovation have become real challenges for business organizations [1]. Innovation refers to the procedures that entrepreneurs and organizations use to conceptualize the latest products and ideas and the processes to advance existing processes, ideas, or products in a novel way [2]. It is the planned modification in the enterprise's actions to improve the growth and performance [3]. To respond to the challenging environment, business organizations pay attention to frugal innovation and the Internet of things (IoT) [1,3].

The origin and starting point of frugal innovation ideas are not clear yet. However, the few research studies conducted mention that this notion was firstly introduced by economists, therefore it has stemmed from the frugal engineering 2006 concept introduced by the chairman and CEO (Carlos Ghosn) of Renault Nissan-Alliance [4] Frugal innovation is the process of designing novel product architecture at reasonable prices that provide consumers with the latest applications, as opposed to the existing solutions [1]. Frugal innovation is a mechanism which enables the organizations to serve the underserved customers who are unable to afford the existing products [4]. Researchers claimed that the IoT acts as a road map for improving the process of innovation [5]. The IoT consists of interconnected devices via a local network or the

Internet [3]. This mechanism provides opportunities for communicating and receiving ideas and information about the advanced business models that have emerged due to digitalization. Particularly in the era of digitalization, digital platform capabilities become an important means through which organizations develop their networks that facilitate the provision of their services in more innovative ways [6]. It is self-evident that the massive improvement in technologies has changed the business environment [7], and more specifically, the operational activities. In this context, organizations use various advanced digital technologies that enable them to be connected all around the world in order to cope with emerging requirements i.e., innovative business operations [5].

Frugal innovation has brought changes to the ways businesses operate, moving from traditional to more innovative ways [8], and such transformation of business's operational activities are exclusively dependent on advanced digital technologies, including the IoT mechanism. Industry 4.0 is the industrial revolution's latest phase, which greatly focuses on automation, real-time data, connectivity, and machine learning [2]. Industry 4.0 is the digital transformation of organizations to digital structures that emphasize digital technology to complete the new level of innovation required in the modern era through the aid of interconnectivity through the IoT and digital platforms [5]. It has entirely changed the way and pattern of organization's operations. Additionally, customer needs and trade and industry requirements also changed with the improved latest wave of digitization. The key purpose of industry 4.0 is to enhance the effectiveness and competence of entire organizations [6]. Industry 4.0 contains various technologies that facilitate digital transformation of the production-, manufacturing- and value creation-related activities of SMEs, because it provides new means and patterns for organizational control and growth for SMEs [1,2]. Transformation means changing the overall strategy, which is a large decision to accept. Industry 4.0 is the rising challenge for businesses due to its automated and digital elements that are based on digital technologies, such as the IoT, digital platforms etc. [5,6].

The IoT that enables business organizations to communicate and connect through the Internet and local networks all around the world is possible due to the advancement of technologies [9]. The IoT assists business organizations in every activity and contributes to the advancement of the operational mechanisms of these organizations [10]. In the era of dynamic business environments, organizations focused on frugal innovation mechanisms as a strategic option for survival and sustainable growth [4]. Frugal innovation refers to the use of existing resources to serve that customer who is unable to afford high-price products and services [11]. The IoT makes it possible for business organizations to adopt new methods of doing business [12]. The adoption of a new business model requires knowledge and information about the successful operational models via the IoT devices [13]. Due to the advancement in technologies, large number of business entities transformed traditional ways of business operations to new ones by adopting the mechanism of frugal innovation [14]. In this regard, the IoT provides a foundation for acquiring required information and adapting new techniques that enable successful frugal innovation. As the IoT plays a critical role for the development of digital platforms and assists frugal innovation, limited studies have been found on the IoT–frugal innovation link to date. Both the IoT and digital platforms can determine frugal innovation; therefore, the current study highlights the foundational role of the IoT for the development of digital platforms and frugal innovation.

Frugal innovation requires major changes in the existing processes of business organizations [11]. Existing literature highlights that most organizations' attempts to implement new processes and programs often fail due to insufficient organizational readiness for those changes [15]. Organizational readiness is the ability of an organization to accept, adapt and implement required change [16]. With higher organizational readiness, organizational members are more inclined to initiate change, put in their best efforts, and demonstrate cooperative behavior and attitudes, which overall results in a more successful and effective implementation of frugal innovation [17]. Members of organizations with higher readiness perceive that they have sufficient resources that will contribute to the proper implementa-

tion of change. Organizational readiness recognizes that organizations depend on existing resources and conditions to implement change and new projects [18]. In line with the importance of organizational readiness for the successful implementation of an innovation project, this study tested the moderating role of organizational readiness on the relationship between digital platforms and frugal innovation.

To achieve the purposes of the study at hand, we divided the manuscript into the following sub-sections. Section 2 contains the literature for the study constructs i.e., the IoT, digital platforms, organizational readiness, and frugal innovation. Section 2 also provides information about the study design, sampling procedures, and measurement scales. In Section 3, we present the results of the data analyzed with the help of various statistical techniques. Section 4 contains the discussion regarding the results, theoretical and practical implications, and the conclusion.

## 2. Materials and Methods

### 2.1. The IoT and Frugal Innovation

The Internet-of-things (IoT) refers to a system of interrelated objects connected by the Internet that collect and receive data and transfer it through a wireless system exclusive of human interference [19]. The IoT is the interconnection of computing machines through the Internet which is implanted in objects to facilitate the receiving and sending of data. [20]. On the other hand, frugal innovation is the development of services and products that are affordable to underserved customers [17].

The IoT is a set of connections of different devices that are attached through the Internet and can exchange and collect data and information with each other. The IoT tool makes sets of data which are mined and are required to be collected for actionable outcomes necessary for frugal innovation and store huge data in the IoT network [21]. The IoT allows for frugal innovation, giving advantages to customers and companies for the development of services and applications to solve and address challenges [14].

**Hypothesis 1 (H1).** *The IoT is positively associated with frugal innovation.*

### 2.2. The Internet of Things and Digital Platforms

Digital platforms refer to commercial networks which facilitate companies and customers to rapidly grow and activate digital services on a large scale [6]. The IoT has increased productivity and the connectivity of people in organizations through various platforms, such as email, live meetings, and social network services, for online feedback and information sharing to a great extent [13]. The development of technology increases the amount of information sharing and invention through connected devices with enhanced number of machines and tools used in this perspective [22]. The dimensions of the IoT are very broad and have economic, environmental and social impacts which add to the sustainability and growth of the digital economy [23]. The IoT not only involves connecting and communicating among devices throughout the globe, but it too offers new opportunities, architectures, service models and new abilities as well [24]. Digital platforms are most often used for the results of the IoT. IoT helps to develop digital platforms [25]. The IoT approach knows how to examine the success of data flow, knowledge, connection, information and attractiveness [26]. The IoT gives opportunities to build up systems globally to connect people, things and data and create a digital platform [27]. The growth in the IoT provides different means to connect smart devices through the Internet to send out data and transmit and obtain information [10]. The IoT provides a foundation for sharing information and content using technological-based infrastructure and platforms that give entrance to global users [28]. The most important use of the IoT applications is interrelated to industrial organization where most projects are implemented [10]. Customers have been trained to operate on digital platforms for capturing value. Online customer markets increase the ability of customers to interact with digital platforms [29]. Therefore, our study disputes that digital platforms are mainly dependent on the IoT. Digital platforms connect things

with systems which are required to maintain global connections and online identity [10]. The IoT showed that digital platform are approachable networks. These are a combination of users, things and consumers who add to create content, take part in e-business transactions and develop businesses [29]. Based on the above discussion, we argue that the IoT has a direct link to digital platforms.

**Hypothesis 2 (H2).** *The Internet of-things is positively associated with digital platforms.*

### 2.3. Digital Platforms and Frugal Innovation

In a competitively shifting environment, one of the significant determinants is frugal innovation. Digital platform refers to the capability to achieve the objectives and targets of an organization through frugal innovation [30]. Digital platforms support frugal innovation with data, services and product processes within and outside of the organization [17]. Digital platforms offer services to communicate and share information with other firms that maybe competitors, consumers, business partners and suppliers [31]. Digital platforms provide opportunities for businesses to increase and enhance their performance by means of frugal innovation [30]. The communication between the supplier and customer who are engaged in business activities through online platforms is recognized as a digital platform, and that plays a significant role in the success of business organizations in a dynamic business environment [32]. Digital platforms get together the partners, developers and customers and create huge markets with critical efficiency in economies through the adoption of frugal innovation [33]. They facilitate organizations by collaborating into many domains and bringing desired new services and products [23].

Digital platforms offer different opportunities for businesses to attain interaction with their customers efficiently and the effectively [34]. Digital platforms generate opportunities, and bring efficiency and productivity for customers and businesses through the adoption of frugal innovation [35]. From the above arguments, digital platforms play an essential role in the adoption of frugal innovation.

**Hypothesis 3 (H3).** *Digital platforms are positively associated with frugal innovation.*

### 2.4. Digital Platforms Mediate between the IoT and Frugal Innovation

Digital platforms carry benefit for customers and businesses in developing connections, while the development of the IoT depends on digital platforms [36]. Our research disputes that digital platforms play a mediating role between the IoT and frugal innovation. Various organizations and enterprises obtain benefit from digital platforms through accomplishment of the IoT and frugal innovation [33,37]. Digital platforms allow to the collection and sharing of data, knowledge and information to boost efficiency of business functions for attain frugal innovation through the IoT [35,38]. The IoT has recommended a broad variety of digital platforms that perform all functions of businesses [22]. The IoT used digital platforms for facilitating businesses in gathering information and data necessary for frugal innovation [39]. The IoT offers a broad variety of digital platforms to businesses for the acquisition of innovation-related information. Digital platforms act as strong connection between the IoT and frugal innovation [38].

**Hypothesis 4 (H4).** *Digital platforms have a mediation effect between the internet of thing and frugal innovation.*

### 2.5. Moderating Role of Organizational Readiness

Organizations are facing difficulties, due to the increasing change in the environment. The extent to which employees are psychologically, physically and behaviorally prepared to adopt to changes and put them into practice demonstrates an organization's readiness [40]. Organizational readiness has the capability to utilize, gain and implement higher compet-

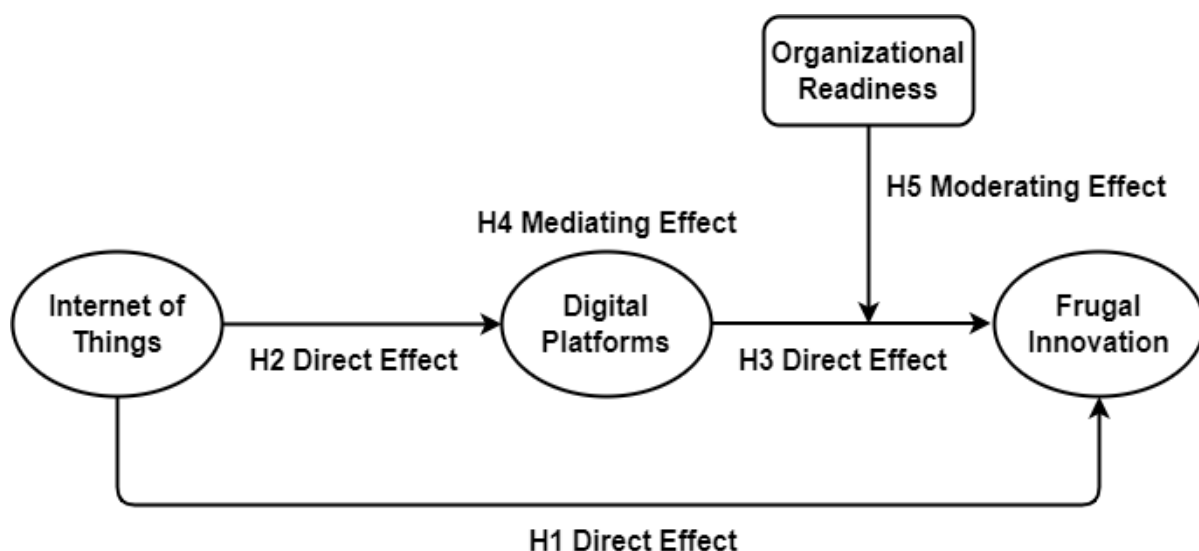
itive benefit through digital platforms by implementing frugal innovation [29]. When a firm's readiness to adopt change affiliates with an organization's help in changing services through digital platforms and expending greater resources to change to processes like frugal innovation, it leads to higher outcomes [9].

Organizational readiness is an important motivating force to modify digital platforms for improving traditional practices in the businesses through frugal innovation [17,30,35]. Although the influence of frugal innovation on business performance is noticeable, organizational readiness facilitates organizations to speed-up processes and delivery service mechanisms offered to their customers via digital platforms [23]. Organizational readiness confirms any firm's tendency to adapt to changes, and consequently makes stronger relationships between digital platforms and frugal innovation. Firms with effective readiness can use their existing reserves and resources and utilize new opportunities to achieve frugal innovation [30]. Organizational readiness helps to enhance and improve the impact of digital platform on frugal innovation as it offers adoptions and modifications [33]. However, it is disputed that the association between digital platforms and frugal innovation can be stronger for organizations with high level of organizational readiness. In a rapidly changing environment, both organizational readiness and digital platforms are mandatory for the successful adoption of frugal innovation. Organizational readiness acts as a helpful factor for business to boost frugal innovation. Therefore, it is argued that organizational readiness moderates positively the connection between digital platforms and frugal innovation. This association is strong when organizational readiness is high.

**Hypothesis 5 (H5).** *Organizational readiness plays a moderating role on the digital platform and frugal innovation link.*

#### 2.6. Theoretical Framework

Figure 1 presents the association of variables i.e., the IoT (independent variable), digital platforms (mediating variable), organizational readiness (moderating variable), frugal innovation (dependent variable).



**Figure 1.** Theoretical Framework.

#### 2.7. Data Collection

A cross-sectional data collection approach was used for testing the hypothesized model. The target population was SMEs listed in Small and Medium Enterprises General Authority (SMEGA) of Saudi Arabia. A list of 687 SMEs was generated for the sampling frame. Only those SMEs are considered for the study sampling which have more than 50 employees and

having an information technology infrastructure. Out of 687 SMEs, only 581 were meet the study criteria. On the basis of a simple random sampling procedure, 234 SMEs are selected as a sample for the study. Questionnaires were distributed with the assistance of research associates and only 196 responses were received from the respondents' firms. Finally, 184 responses were considered for study analyses which were completed in all respects. SPSS 25.0 and AMOS 25.0 were used. Table 1 presents the characteristics of respondents.

**Table 1.** Characteristics of respondents (n = 184).

Work Experience (Years)		Respondents Age (Years)	
1 to 5	19 (10.32%)	22–33	55(29.80%)
6 to 10	45 (24.45%)	34–45	59 (32.20%)
11 to 15	67 (36.41%)	46–57	45(24.50%)
16 to 20	37(20.10%)	58–69	25(13.50%)
More than 20	16 (08.69%)		
Education level			
0	High school or less education	16 (8.69%)	
1	Intermediate education	18 (9.78%)	
2	14 years education	34 (18.47%)	
3	16 years education	77 (41.84%)	
4	More than 16 years education	39 (21.19%)	

## 2.8. Measurement

The respondents were requested to provide data (based on a likert scale) about the IoT, digital platforms, frugal innovation and organizational readiness.

### 2.8.1. Internet of Things

The items for the measurement of the IoT was taken from the work of De Vass et al. [12]. A nine-item scale was used to measure the construct of the IoT ( $\alpha = 0.84$ ).

### 2.8.2. Digital Platforms

The measurement of digital platforms was comprised of an 8-item scale adapted and modified from Rai and Tang [41] ( $\alpha = 0.81$ ).

### 2.8.3. Frugal Innovation

Frugal innovation was measured with a 9-itemscale developed and validated by Rossetto et al. [42] ( $\alpha = 0.85$ ).

### 2.8.4. Organizational Readiness

Organizational readiness used as a moderating variable measured with a 6-item scale developed and validated by Claiborne et al. [43] ( $\alpha = 85$ ).

## 3. Results

Descriptive, SEM and Preacher and Hayes [44] approaches were used for analysis. To establish the discriminate validity of the study constructs, we applied Fornell and Lacker's approach [45]. Table 2 contained the outcomes of reliability test and discriminant validity i.e.  $\alpha$ , loadings CR and AVE.

**Table 2.** Outcomes of discriminant validity.

	Items	Cronbach's Alpha	Factor Loading	Composite Reliability CR	AVE
Internet of Things	08	0.80	0.70–0.91	0.87	0.68
Digital Platforms	08	0.86	0.73–0.89	0.92	0.71
Organizational Readiness	09	0.88	0.72–0.90	0.94	0.73
Frugal innovation	09	0.84	0.74–0.93	0.90	0.70

Four models with different configurations were used to test the model fitness with the help of the CFA technique. Table 3 presents the outcomes of the CFA and shows that the hypothesized models have satisfactory scores that support the model fitness i.e. values of RMESA, GFI and CFI meets requirement.

**Table 3.** Coefficients of CFA.

	$\chi^2$	Df	$\chi^2/df$	RMESA	GFI	CFI
Hypothesized-model	844.34	389	2.164	0.06	0.92	0.94
Three-factor-model	902.65	379	2.507	0.16	0.86	0.88
Two-factor-model	967.58	311	3.121	0.21	0.80	0.82
Single-factor-model	989.21	291	3.411	0.27	0.64	0.66

### 3.1. Correlation Results

Table 4 shows the IoT and digital platforms have a strong positive correlation (0.39\*\*). These results show that firms inclined to use the Internet can develop strong digital platforms. Similarly, there is strong positive correlation between the IoT and frugal innovation (0.22\*\*) i.e., indicating that FI is also linked with the IoT. The IoT and organizational readiness (0.26\*\*) show good positive association. Digital platforms and frugal innovation also have strong positive (0.33\*\*) and organizational readiness (0.19\*\*). Similarly, the organizational readiness is positively associated with frugal innovation (0.17\*\*). Based on these correlation results, the next analysis and our proposed theory becomes more logical. Hence, we tested study hypotheses.

**Table 4.** Coefficients of correlation.

Constructs	Mean	SD	1	2	3	4	5	6	7	8
Gender	0.9	0.81	1							
Age	33	—	0.09	1						
Work experience	2.9	0.84	0.08	0.03	1					
Education level	2.4	0.91	0.06	0.05	0.04	1				
Internet of Things	3.8	0.93	0.09	0.09	0.08	0.07	1			
Digital Platforms	3.5	0.91	0.05	0.07	0.04	0.05	0.39 **	1		
Organizational Readiness	3.9	0.95	0.03	0.07	0.06	0.09	0.26 **	0.19 *	1	
Frugal Innovation	3.6	0.90	0.08	0.03	0.04	0.09	0.22 **	0.33 **	0.17 *	1

Note: SD (Standard Deviation). \* = sig0.005; \*\* = sig0.001.

### 3.2. Hypothesis Testing

In order to test the direct effect, a SEM approach was used in the current study. All the paths in SEM confirmed and showed significant effect. The coefficients of the path analysis were presented in Table 5. The results revealed that the IoT directly and significantly affect frugal innovation ( $\beta = 0.20^{**}$ ). The IoT is positively and significantly linked with digital platforms ( $\beta = 0.37^{**}$ ). The results also revealed that digital platforms have a significant effect on frugal innovation ( $\beta = 0.34^{**}$ ). Therefore, the study H3 is supported.

**Table 5.** Hypothesis testing.

Hypothesis Detail	Effects	Coefficient	Remarks
(H1) IoT to Frugal Innovation	+	0.20 **	Accepted
(H2) IoT to Digital Platforms	+	0.37 **	Accepted
(H3) Digital Platforms to Frugal Innovation	+	0.34 **	Accepted

\*\*  $p < 0.1$ .

### 3.3. Mediating Role of Digital Platforms

The study hypothesis 4 is regarding the mediation effect of digital platforms between the IoT and frugal innovation. The outcomes of mediation analysis were depicted in Table 6. The mediating effect of digital platforms between the IoT and frugal innovation is confirmed as the value of indirect effect which is significant i.e., ( $\beta = 0.1671$ , lower value = 0.1932, Upper value= 0.2319; SE = 0.329).

**Table 6.** Results of indirect effect of Internet of things.

Model	Data	Boot	Bias	SE	Lower	Upper
IoT → digital platforms → frugal innovation	0.1671	0.1663	−0.0008	0.329	0.1932	0.2319

Note: IoT (Internet of Things).

### 3.4. Moderating Role of Organizational Readiness

The moderating role of organizational readiness for digital platforms and frugal innovation is analyzed through regression. Table 7 contains the coefficients of moderation analysis. Steps 1 and 2 provide information about the base model, while the moderation of organizational readiness on the connection between digital platforms and frugal innovation are depicted in Step 3 which shows interaction i.e., digital platforms  $\times$  organizational readiness i.e., ( $\beta = 0.24$ ,  $p < 0.01$ ).

**Table 7.** Outcomes of hierarchical regressions.

	Step 1	Step 2	Step 3
Moderation of organizational readiness			
Gender	0.011	0.009	0.007
Respondent Age	0.019	0.016	0.013
Respondent experience	0.009	0.007	0.005
Respondent Education	0.021	0.029	0.037
Digital Platforms		0.30 **	0.33 **
Organizational Readiness		0.26 **	0.28 **
Digital Platforms $\times$ Organizational Readiness			0.24 **
R <sup>2</sup>	0.009	0.191	0.198
Adjusted R <sup>2</sup>	0.003	0.159	0.175
$\Delta R^2$	0.007	0.163	0.028
$\Delta F$	4.172	79.63	17.13

Note: \*\*= sig0.001.

## 4. Discussion

Due to the advancement and effect of the IoT on businesses, previous researchers explored the IoT impacts on businesses. However, the role of the IoT for the enhancement of frugal innovation has been ignored. It is self-evident that frugal innovation is a comprehensive range of innovative activities that help organizations in the achievement of their targets, relative performance, and implementation of business strategies. In summary, our study suggested a framework that gives numerous theoretical and practical implications interrelated to the IoT and organizational readiness to positively impact on digital platforms and frugal innovation.



The IoT provides numerous opportunities to achieve business objectives and keep a competitive business position. Frugal innovation is affected by a variety of features of digital platforms provided by the IoT. The results of H1 showed that the IoT enable businesses to perform strategically. This study proposed a framework that offers direction to businesses in developing-countries that the IoT helps in attaining frugal innovation. Previous studies support this linkage that the IoT is set of connections of different devices that are attached through the Internet and can exchange and collect data and information with each other, the IoT tool makes sets of data which are mined and required to-be collected for actionable outcomes [22]. The IoT allows frugal innovation to give advantages to customers and companies for the development of services and applications to solve and address emerging challenges [23]. H2 of our study validated that the IoT has a positive relation with digital platforms and upheld the prior researchers' work about the IoT and digital platforms that was studied. However, it is stated that effective utilization of the IoT brings advancement and development in digital platform services. The IoT has increased the task of connecting people and productivity in organizations through various platforms, such as emails, live meetings, and social network services, for online feedback and information sharing to a large extent [12]. Development of technology increases the information sharing amount and invention through connected devices with enhanced number of machines and tools used in this perspective [29]. The H3 showed that digital platform shave a positive influence on frugal innovation. The outcomes recommend that digital platform be able to help organizations to achieve frugal innovation and perform strategically. Digital platforms refer to the capability to achieve the objectives and targets of an organization through frugal innovation [36]. Digital platforms support frugal innovation for services and product processes within and outside of the organization [37]. H4 shows that various services of the IoT, such as gadgets and software, were established to influence frugal innovation through digital platforms. Organizations that implement the IoT are capable of formulating the effective use of digital platforms, which consecutively can lead organizations to attain frugal innovation. Previous research supports that digital platforms carry benefit for customers and businesses through frugal innovation [42]. The H5 results proposed that organizational readiness act as key aspect in relation between digital platforms and frugal innovation. In line with research findings, it was observed that organizational readiness plays a moderating role on the IoT and frugal innovation. When the IoT is more effective in contributing positively to digital platforms, a high-level of the organizational readiness plays an important role for frugal innovation through digital platforms. Overall, our study adds to important literature streams of the IoT, digital platforms, frugal innovation and organizational readiness, by showing why, how, and when the IoT helps organizations to achieve frugal innovation.

#### *4.1. Theoretical Implications*

The current study provides various theoretical implications to a rising body of the research about the IoT, digital platforms, and frugal innovation. Prior studies on the IoT in an organizational context focused on conventional measures of performance. Our study expanded the previous literature through focusing on the performance and explained how the IoT and digital platforms can positively impact on frugal innovation activities. In doing so, the current study presented a comprehensive framework looking at organizational innovation performance.

Moreover, preceding research investigated different aspect of the IoT, such as e-commerce, e-marketing and digital platforms, and associated these aspects with business performance. The potential of the IoT in helping organizations to formulate frugal innovation through the mediating role of digital platforms is ignored. The current study provides a comprehensive framework for the understanding of the role of the IoT and digital platforms in frugal innovation. On the other hand, organizational readiness facilitates a firm's management to use the IoT for advancing digital platform practices. This expansion to the

conceptual framework via considering the moderating role of organizational readiness is a major contribution to previous theory.

Finally, we built up a framework that enlightens how organizations achieve frugal innovation via the IoT and digital platforms by contextualizing theoretical relationships between the IoT, digital platforms and frugal innovation in developing countries. This is an important contribution to the business sector for the adaptation of frugal innovation.

#### 4.2. Practical Implications

The present study suggested some practical implications to the business industry. First, this study helps the manager and owner of an organization to better understand the relationship between the IoT, digital platforms and frugal innovation. It facilitates management to implement and use the advanced developments such as the IoT and digital platforms which match the organization's strategies and fulfils the consumers' needs. Second, one key important benefit of the implementation of the IoT is that it provides online reservations, which makes it convenient for consumers and encourages customers to repeatedly use online services. Finally, the IoT plays a prominent role for firms to help them in formulating frugal innovation via information and knowledge sharing platforms, along with sharing customer reviews, which attract customers to avail themselves of online services, which enhances the performance of firms through cost reduction and increasing profit. In conclusion, the study conquered the limitations of existing research in business firms by providing knowledge and information concerning how firms can achieve frugal innovation via the IoT and digital platforms.

### 5. Conclusions and Recommendation

This research study contains several limitations that act as a direction for future researchers. Firstly, our research was carried out into SMEs of Saudi Arabia only. Next time maybe larger industries and other countries could be used for further insights. Secondly, current study has used the cross-sectional method for the collection of data. Prospective researchers may use qualitative or quantitative methods for data collection. Thirdly, in the near future, maybe SMEs use the Industry 4.0 elements M2M, ML and digitization, which provide modern and innovative solutions to SMEs for solving problems and overcoming the emerging challenges of the digital world. This research used the IoT and digital platforms as mediating variables, and organizational readiness as a moderating variable for the achievement of frugal innovation. The SMEs are different from large firms, so future study may use diverse variables for research in this sector. Future study may be conducted to achieve sustainable development through these factors [46]. These limitations may be addressed in future research.

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