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Empirical investigation into impact of IT adoption on supply chain agility in fast food sector in Pakistan

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Abstract: Information technology and supply chain agility are in vogue. The present study aims to investigate the impact of information technology (IT) on supply chain agility and its outcomes such as cost reduction and operational performance in fast food companies' chains. A total of 240 employees from fast food chains were selected as respondents. Data was collected using five-point Likert scale questionnaire developed from previous studies. The statistical results confirmed that adoption of IT is playing a vibrant role in achieving supply chain agility and supply chain agility helps to reduce cost and improves operational performance of firms. The study model provides a useful framework to examine the impact of IT adoption on supply chain agility and its outcomes. In conclusion, the firms have to focus on their supply chain management and make it efficient and agile by implementing the advanced technologies to gain operational performance. Implications have been discussed.

Subjects: Operations Management; Supply Chain Management; Management of Technology & Innovation; Administration andManagement; Management & Organization

Keywords: IT adoption; supply chain agility; cost reduction; operational performance; supply chain management

1. Introduction

Over the past decade, supply chain and Information technology (IT) have gained much importance in context of business performance across academia and industry. As IT provides a foundation to firms to have progress and advance their supply chain management (SCM) systems (Dehgani & Navimipour, 2019). Most of the organizations have realized that to gain the competitive advantage, it is important to sustain and build the effective supply chain system of product and services. (Gunasekaran & Ngai, 2004). It is almost impossible to achieve an effective supply chain management without technology advancement since IT plays a vital role in it (Gu et al., 2021; Handfield & Nichols, 1999). The usage of technology in SCM has made the business processes easier that focus on innovation and improvement between customers, suppliers, and companies (Ahmadi & Letter, 2021; Barua et al., 2004). Many organizations improve their performance by keeping focus on their information technology and manage it as a key element of supply chain.

The increased global competition has compelled firms to strive in a competitive market by focusing and enhancing many areas of business. For this reason, companies need to remain fast, flexible, alert, and adaptive to any sudden or unexpected change in the market. This need has emerged a concept in supply chain, i.e., supply chain agility. According to Prater et al. (2001) supply chain agility is "the ability of an organization and its supply chains to adapt swiftly to

changing and unpredictable environmental conditions" (as cited in Khan & Wisner, 2019). Supply chain agility is a complex phenomenon and requires intensive resources from the company side. One of the key resources that can help to achieve the supply chain agility is technology. As technology is significant for improving business performance in all areas including supply chain (Craighead et al., 2017)

Due to increased environmental uncertainties, firms are gradually depending on information technology (IT) to make certain the competitive advantage (Liu et al., 2013). At the same time, in the area of supply chain, firms are determined to increase inventory turnover by reducing cost (Brusset, 2016). Therefore, having supply chain agility has gained a paramount importance due to several reasons, e.g., adopting to changing market and customer's demands (D. M. Gligor et al., 2015). Recent crisis of Covid-19 pandemic has exposed many vulnerabilities of global supply chain. Although academia has always stressed on the need of supply chain agility and resilience (Aarti Gumaledar et al., 2021), however, during the period of Covid-19, many firms could not practice it. Here, information technology came as a survivor. For example, "During Covid-19, hospitals were able to use online platforms to access and share crucial supplies of personal protection equipment (PPE) and ventilators, moving from S1 to S3 overnight. Tech giants like Alibaba used their shopping and logistics infrastructure to support farmers in Hubei to revive sales post-lockdown. Apple and Huawei partnered with delivery platform Meituan Dianping to deliver smartphones to customers' doorsteps. At the same time, Alibaba itself tapped the online freight platform Freightos to serve its international buyers and sellers" (Aarti Gumaledar et al., 2021).

Recent advances in technology especially moving to the Fourth Industrial Revolution (Industry 4.0) had changed the manner in which we view the customary supply chain. "Despite these resources and wide-ranging rates of adoption and realization of benefits from the adoption of Industry 4.0, there is a variation between services and manufacturing sectors, and it came as no surprise that there was a limited supply of past research works and literature around the subject". Moreover, it was also noticed that there are limited studies available on the effect of supply chain agility on organizational performance (D. M. Gligor et al., 2015). Although IT capabilities and their effects have been discussed in previous studies in developed countries, however, such issues in the view of supply chain capabilities in developing countries are scarce, despite the fact that firms in developing countries face a challenge to integrate IT systems in operations and supply chain (Irfan et al., 2019). Despite having an increased attention toward the supply chain management practices academically and by practitioners, still there are chances of failure that exist (Kumar et al., 2014). Therefore, it is essential to understand that how adoption of IT systems in supply chain facilitates supply chain agility and what effects can a supply chain bring in firms. The recent vulnerabilities exposed by Covid-19 in global supply chain have increased the need to investigate multiple aspects in supply chain. The present study has tried to fill the literature gap by linking IT adoption with supply chain agility and its effects on organizational performance parameters.

The current study has objective to find empirical evidence that to what extent IT adoption will bring supply chain agility and consequently, what would be the impact of supply chain agility on cost reduction and operational performance of firms in a developing country context. In this scenario, supply chain agility will act as a mediator between IT adoption and cost reduction and operational performance. The study's objectives are followed by answering the study's central research questions: How does the IT adoption in supply chain network facilitate the supply chain agility and how does supply chain agility mediate the effect of adoption of IT on cost reduction and operational performance of firms?

After the introduction, section two includes previous literature review and theoretical foundations as well as research model. Section three discusses the methodology of the research which explains how the research was conducted. Section four includes the statistical results and hypotheses testing. The next section discusses the findings of the study, conclusion, limitations, and the future directions of the study.

2. Literature review

2.1. Dynamic Capabilities View (DCV)

Resource-based view (RBV) depicts that firm resources are valuable, hard, and rare to substitute to get the competitive advantage (Melville et al., 2004; Seo et al., 2021). Due to certain gaps in RBV, a new framework of the dynamic's capability emerged. According to Teece et al. (1997, p. 516) dynamic capabilities (DC) are, "*the firm's ability to integrate, build and reconfigure internal and external competencies to address rapidly changing environments*". The dynamic capability's view has been considered as a complete framework to provide explanation of gaining competitive advantage (e.g., Sirmon et al., 2010; Teece et al., 1997). The "DC approach has become more influential because of increasingly unpredictable environmental challenges, such as the global financial crisis, climate change, and emerging economies" (D. Li & Liu, 2014).

According to Wade and Hulland (2004), information system resources may take on a considerable lot of the credits of dynamic abilities, and subsequently might be especially valuable to firms working in dynamic environment. Subsequently, regardless of whether information system resources don't straightforwardly lead the firm to a place of predominant competitive advantage, they may in any case be basic to the company's more extended term intensity in shaky environments in case they assist it with creating, add, incorporate, and discharge other key resources over the long run. Breznik and Lahovnik (2014) pointed out that "The DCV has received a lot of attention in recent years, although the outcome is a complex, sometimes confusing body of research with limited empirical studies".

The dynamic capabilities (DCs) view emphasizes that firms should have the capability to renew their strategic capabilities in order to respond to the dynamic environmental changes (Linden & Teece, 2018; Teece, 2007). Along with the investments, firms should develop such capabilities that competitors cannot easily replicate (Pisano, 2017; Teece, 2014). Recent trends in technology and supply chain have made information technology and supply chain agility an important capability of firms that can bring competitive advantage for firms. IT helps the organizations to improve the productivity as well as helps focus into noteworthy learning on both marketing and supply chain management; therefore, there is significant relationship between performance and the information technology. Due to technology advancement, companies are able to be more responsive to their value able customers (Wieder et al., 2006), thus becoming more agile.

2.2. IT adoption and supply chain agility

Nowadays, technology is not just using computers; instead, it includes wide-ranging features, right from automation in factory site, boosted communication devices, data recognition equipment, internet of things, big data, cloud computing as well as blockchain technology. Organizations mostly use technology in three extensive areas, namely transaction processing, collaboration and supply chain planning, and delivery synchronization order tracking (Shcherbakov & Silkina, 2021). In response to the COVID-19 outbreak, restaurant technology adoption has surged. Most restaurants and stores have shifted away from in-store transactions in favour of more technical ones, including online ordering, curbside and in-store pickup, as well as delivery services, in order to remain competitive. Restaurants have now moved to digital menu boards, thus increasing customer experiences and satisfaction as well.

During and after Covid-19, the one area of business that has got major setbacks was supply chain. Therefore, both academia and industry attempted to search and assess the ways that could help in accelerating technology implementation (Van Hoek & Lacity, 2020). "It is clear that technology holds the key to unlocking at least some of these problems, and, when applied to supply chains, powerful change is possible. Through cloud-based networks that link together buyers and suppliers, businesses are gaining extraordinary visibility into supply chains. This is allowing them to assert accountability over sourcing decisions previously seen as far removed" (Tucker, 2020). Information technology has played a very important role during Covid-19, as firms

shifted to remote based work. Roffman (2020) observed that for achieving and maintaining supply chain agility, companies should be able to relocate their resources and facilities in multiple locations and information technologies like cloud and browser based can facilitate this. A recent report by Deloitte (2020) conveyed that the customary perspective on a linear supply chain is changing into digital supply networks (DSNs) (DSNs) where there is complete connection with your full supply network to empower end-to end perceivability, joint effort, responsiveness, agility, and advancement. Hence, it has been hypothesized that

H1 = Adoption of IT has significant and positive effect on supply chain agility of firms.

2.3. Supply chain agility and cost reduction

Agility has been recognized as one of the most striking subjects of current supply chain management (Gligor & Holcomb, 2012). Supply chain agility has reported to be having multiple effects on various firms' areas. One of the key areas is cost reduction where supply chain agility can have a significant impact. Cost reduction is a goal that is set by organizations in order to reduce their operating costs variables including expenses and expenditures for maximization of their profit. The firms want to decrease the cost in supply, storage cost, intermediaries cost, and transportation cost. System management has been proven as playing a critical role in minimizing the costs (Gharaei & Almehdawe, 2021). Moreover, supply chain integration has been considered as a key factor in reducing the cost (Gharaei et al.,) and demand about supply chain quality and integration has been on rise due to the global competition and better customer services (Gharaei, Amjadian et al., 2021, 2021; Gharaei, Diallo et al., 2022; Taleizadeh et al., 2022). An effective supply chain process and design assists to bring significant cost reduction in supply chain as well as improvements in service providing levels by aligning supply chain technology and strategies (Chaudhuri et al., 2021).

Supply chain agility aids firms too efficiently and cost effectively manage supply chain disruptions (Blome et al., 2013), which are certainly a major cost factor for worldwide supply chains (Hendricks & Singhal, 2005). Firms have witnessed it during recent Covid-19 pandemic. Many previous studies supported this relation, e.g., Eckstein et al. (2015) empirically found that supply chain agility has influence not only on cost performance but also on operational performance. D. M. Gligor et al. (2015) empirically found a direct relationship between supply chain agility and cost reduction or efficiency. They also highlighted that in previous literature "As such, the relationship between agility and cost is not clear due to limited empirical scrutiny from researchers. Further, the relationship has yet to be empirically examined in a supply chain setting. This is a significant gap in the literature". Along with the supply chain agility, information technologies have also been considered as a major factor of cost reduction in supply chain. For example, (Choi et al., 2018) argued that technologies like big data and artificial intelligence support firms decrease channel costs. Li (2020) also advocated the used of smart technologies for reduction in channel cost. Hence, it has been hypothesized that

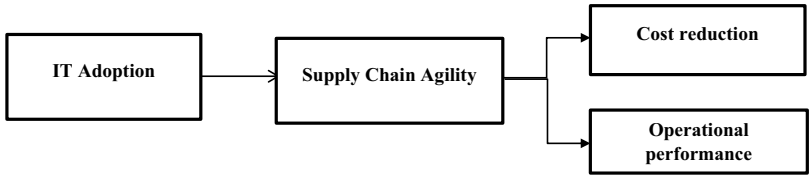
H2 = Supply chain agility has positive and significant effect on cost reduction of firms.

H2(a) Supply chain agility mediates the relationship between IT adoption and cost reduction of firms.

2.4. Supply chain agility and operational performance

Operational performance indicated "an organization's level of functioning, as weighed against typical benchmarks of efficacy, productivity, and environment accountability— including waste reduction and regulatory acquiescence" (Omoush, 2020). Vanichchinchai (2014) observed that several firms use their operational ability to actively respond to environmental changes and

Figure 1. Research model.



demands, in return gaining competitive advantage. Gligor and Holcomb (2012) confirmed a significant association between supply chain agility and organizations' operational performance.

"The agility of SCM helps companies use optimal resources, reduce costs, reduce inventories, prevent mistakes and damage, provide consistent delivery processes, improve the productivity of production and logistics and improve business and financial performance" (Dehgani & Navimipour, 2019, p. 14). Nath and Agrawal (2020) argued that agility, being a dynamic capability, has a positive impact on operational performance of firms. In firms, one aspect of the operational performance, that is robust scheduling, has been emphasized in various studies such as Souza et al. (2022).

By doing a detailed review of previous literature on supply chain agility Al Humdan et al. (2020) found that there are fewer consensuses about the supply chain agility outcomes in terms of performance as it encompasses both financial and non-financial measures. In their words, "The failure to represent a set of financial and non-financial measures in a balanced framework, the inconsistencies in performance indicators and constructs and the slightly contradictory findings all indicate that there is no universal consensus regarding suitable measures of SCA performance outcomes and that the commonly implemented SCA measurements are fragmented" (Al Humdan et al., 2020). This indicates a need for more studies related to performance outcomes of supply chain agility. Therefore, it has been hypothesized that:

H3 (a) = Supply chain agility has significant effect on operational performance of firms.

H3 (b) Supply chain agility mediates the relationship between IT adoption and operational performance of firms

The conceptual framework is shown in Figure 1.

3. Materials and methods

3.1. Research Design and Sample

The nature of this research is quantitative, and the study research design is causal. For the study, fast food companies working in Pakistan were selected. Fast food companies need to have an effective and agile supply chain as if there is delayed in time, the food gets spoiled, and quality of product can get affected. Therefore, fast food companies need to remain alert that the right products reach the right customer at the right price, at the right time and in right condition, and this can be done only by having the agile supply chain. A large number of companies in the food industry get their feedback from the customers, and they utilize the suggestions given by the customers in the development of the products. Moreover, fast food industry is highly competitive in nature as many small and big players are operating into it such as Mcdonald's and KFC.

This study used a quantitative survey by using a structured questionnaire. The survey research was adopted as survey research is ideally suited for remotely collecting data about a population that is too large to observe directly. In the study, fast food firms in the whole country were difficult to measure. Hence, sample was taken from the population to study the intended area of research.

For this managerial level of employees were selected as respondents. They were selected as our respondents because they actively participate in the process, making them aware about and experienced in all operations and activities inside their fast food branches. Secondly, the objective measures of certain variables are mostly available at the head office levels. Due to less access to all fast food chains' main branches or head office, objective data in the form of reports was not possible and this is the limitation of this study. Thirdly, a gap in previous literature was found, e.g Seo et al. (2021) mentioned about their study that "As much of our data were extracted manually from quarterly and annual reports, a fairly large amount of data were unavailable, primarily because lodging firms began to report specific asset- and performance-related data in the late 1990s. Future research can improve on this study by adopting a survey research design to better reflect managerial perspectives towards DC (dynamic capabilities) and their impacts on performance". Hence, the current study, by adopting survey approach for reflecting the managerial perspectives, fulfills this gap.

Managers from fast food companies were the unit of analysis. The total sample size was the 240 respondents. For data collection, the sampling chosen for this study falls in the non-probability sampling techniques type that is convenience sampling that was used for the study. For this study, convenience sampling is appropriate because this technique is the best to approach the respondent due to the resource and time constraints.

3.2. Research instrument

For data collection, a questionnaire was used as a research tool. The questionnaire consisted of two sections: the first section was about the background information of respondents, and the second part was about the study constructs variables. The second part was based on previous study items. The six items of adoption of IT variable were taken from the studies of Zhang and Dhaliwal (2009) and Sanders and Premus (2005); six items for supply chain agility were adopted from the study of Swafford et al. (2006). Five items for operational performance were adopted from the study of Flynn et al. (2010), and five items of cost reduction were adopted from the study of Thapa (2014). The questionnaire was scaled on 5-point Likert scale depicting 5 = "Strongly Agree", 4 = "Agree", 3 = "Neutral", 2 = "Disagree" 1 = "Strongly Disagree". For the demographic information, five informational questions about age, gender, experience, organization and designation were asked.

3.3. Data collection

Data was collected through personally administered questionnaire by visiting the fast food chains in two cities of Pakistan. Respondents were approached in their offices and fast food restaurants. Some questionnaires were returned back during first visit; however, there were some questionnaires that were returned by the respondents next day of first visit.

3.4. Data analysis

The quantitative data analysis was performed by using softwares SPSS and AMOS. The descriptive and hypotheses testing was conducted in SPSS PROCESS macro by Hayes and Preacher. This macro is based on bootstrapping method and is easy to use, providing less complexity in data analysis (Hayes et al., 2017).

4. Results

4.1. Demographic Analysis

The demographic information of 240 respondents is presented in Table 1. The gender information shows that male respondents were 203 and females were 37 out of the 240 respondents. This shows that more than 84.6% were males, while 15.4% were female respondents. Regarding age, the table shows that 73.8% respondents were having ages of 20–30, 22.5% were between the ages of 31 and 40, while 3.3% were between 41 and 50 years and only 1 respondent was between the age of 51 and 60 years. In terms of work experience, 39.6% were having less than 1 year

Table 1. Demographic statistics of respondents

Factor	Options	Frequency	Percentage
Gender	Male	203	84.6%
	Female	37	15.4%
Age	20–30	177	76.7%
	31–40	54	20.4%
	41–50	8	2.5%
	51–60	1	0.4%
Experience	less than 1 year	95	39.6%
	2–3 years	76	31.7%
	5 years	46	19.2%
	More than 5 years	23	9.6%

experience, 31.7% respondents indicated their 2–3 years of experience, 19.2% respondents marked the 5 years option, and only 9.2% respondents chose more than 5 years of experience. All staff members selected for the study were managerial level. The fast food chain name was kept confidential.

4.2. Correlation, mean, and standard deviation

Pearson correlation was used to show the relationship among the variables. The positive values of *r* show that variables are positively correlated with each other and increase in one will bring increase in other as well. The negative sign depicts the opposite direction of effect, i.e., the increase in the value of one variable brings decrease in the other variable.

Table 2 shows values of mean, standard deviation and the Pearson correlation of all variables. The mean value for adoption of IT (*M* = 3.91, *S. D* = 0.564), supply chain agility (*M* = 4.011, *S. D* = .539), cost reduction (*M = 3.881, S. D = .650)*, and for operational performance (*M* = 3.868, *S. D* = .617). The table also shows that highest correlation values was found between operational performance and IT Adoption (*r* = 0.555**), while lowest correlation was found between supply chain agility and IT adoption (*r* = 0.341**). All correlation values confirm a significant positive relationship among variables.

4.3. Reliability and validity

Reliability analysis refers to the measure to assess the internal consistency of scale items. For reliability analysis Cronbach's alpha values were computed, and for validity analysis factor analysis was also done. Table 3 shows the values of reliability and validity analysis.

Table 2. Correlation, mean, and standard deviation

	1	2	3	4	M	S.D
Adoption of IT	1				3.91	0.564
Supply chain Agility	0.341**	1			4.01	0.539
Cost reduction	0.490 **	0.551**	1		3.88	0.650
Operational performance	0.555**	0.503**	0.430**	1	3.86	0.617

Note: M = Mean; S.D = Standard Deviation, *p < 0.05, **p < 0.01, N = 240

Table 3. Factor loading, Average Variance Extracted (AVE), and Composite Reliability (CR) Cronbach's α

Variables	Items	Factor Loadings	AVE	CR	Cronbach's α
IT adoption	IT1	0.7	0.59	0.81	0.723
	IT2	0.72			
	IT3	0.75			
	IT3	0.71			
	IT5	0.77			
Supply Chain Agility	SCA1	0.81	0.64	0.85	0.812
	SCA2	0.79			
	SCA3	0.78			
	SCA4	0.8			
	SAA5	0.76			
	SCA6	0.83			
Cost reduction	CR1	0.75	0.65	0.8	0.714
	CR2	0.78			
	CR3	0.79			
	CR4	0.71			
	CR5	0.73			
Operational performance	OP1	0.83	0.6	0.89	0.724
	OP2	0.85			
	OP3	0.8			
	OP4	0.81			
	OP5	0.84			

After demographic frequency analysis, reliability and validity analysis was done. For validity analysis, the factors were loaded by conducting confirmatory factor analysis (CFA). The results in Table 3 show that all factors' items scored above 0.7, which confirms content validity of items that were adopted from previous literature. The values of composite reliability (CR) of all factors are above 0.6, confirming the intrinsic quality of the model while the measures of average variance extracted (AVE) are above 0.5, confirming the discriminant validity of scale. The values of Cronbach's α depict the internal consistency of selected items. The values are above the critical value of 0.7. Hence, both validity and reliability analysis were confirmed in this study.

4.4. Hypothesis testing

The study hypotheses were tested in SPSS using PROCESS macro. As the hypotheses involve mediation effects, hence, model 4 of the macro was applied. This macro is based on bootstrapping method which delivers easy, straightforward, and appropriate estimate for confidence intervals and standard errors for complex parameters (Hayes et al., 2017). To test the mediation effect, the following effects were calculated.

X variable predicting Y—Path c

X variable predicting M- path a

X and M together predicting Y-

M variable predicting Y-path b

X variable no longer predicts y or its effect is lessened—path C′

By using model 4 in SPSS, PROCESS macro, first IT adoption was regressed upon supply chain agility. The results shown in Table 4 confirm that IT adoption has significant positive effect on supply chain agility (β = .32, p = .000). Thus, hypothesis 1 was supported. Next, supply chain agility impact was checked upon cost reduction, and it also indicated a positive relation (β = .56, p = .003). Therefore, Hypothesis 2(a) was also accepted. To test the mediation hypothesis, first the impact of IT adoption on cost reduction was checked. The result came significant (β = .33, p = .001). When supply chain agility was included as mediator, the effect also remained significant (β = .15, p = .000) but the effect of IT adoption on cost reduction was reduced from (β = .33- β = .15) with the inclusion of mediation. Hence, partial mediation exists. Therefore, hypothesis H2(b) was accepted. The Sobel test result that is known as Normal theory tests for indirect test also confirms that mediation exist in this model (*z = 4.54, p = .000*). The values of LLCI and ULCI, i.e., upper and lower level of confidence interval, did not show zero which indicate the existence of mediation. The values for IT adoption and cost reduction confirm the significance of their combined contribution (*F = 45.14, p = .000, R^2 = .28)* in explaining the outcome variable.

Hence, the hypotheses H1 = ***IT adoption has significant and positive* effect on *supply chain agility***

H2 (a) = Supply chain agility has significant and positive* effect on *cost reduction and H2 (b) = supply chain agility mediates the relationship between IT adoption and cost reduction were proved.

The results shown in Table 5 indicate that IT adoption has significant positive effect on supply chain agility (β = .32, p = .000). Thus, hypothesis 1 was supported. Next, supply chain agility impact was checked upon operational performance and it also indicated a positive relation (β = .28, p = .001). Therefore, Hypothesis 3(a) was also accepted. To test the mediation hypothesis, first the impact of IT adoption on operational performance was checked. The result came significant (β = .60, p = .000). When supply chain agility was included as mediator, the effect also remained significant (β = .51, p = .000). This shows that effect of IT adoption on operational performance was reduced from (β = .60- β = .51) with the inclusion of mediation. Hence, partial mediation exists. Therefore, hypothesis H3(b) was accepted. The Sobel test result that is known as Normal theory tests for indirect test also confirms that mediation exist in this model (*z = 3.45, p = .0006*). The values of LLCI and ULCI, i.e., upper and lower level of confidence interval, did not show zero which indicate the existence of mediation. The values for IT adoption and cost reduction confirm the significance of their combined contribution (F = 66.98, p = .000, R^2 = .361) in explaining the outcome variable.

Hence, the hypotheses ***H3 (a) = Supply chain agility has significant and positive* effect on *operational performance and H3 (b) = Supply chain agility mediates the relationship between IT adoption and operational performance*** were proved.

5. Discussion

The findings confirm all hypothesized relationships among variables which show that IT adoption in a fast food firm helps to achieve the supply chain agility which in turn positively effect on cost reduction and operational performance of firms. Technology adoption in supply chain facilitates planning, collaboration, and integration, so improving the overall usefulness of the process in supply chain. Information technology has been used to share planning-related information like demand forecasting, inventory level, production capacity, and customer feedback. IT is also beneficial for delivery coordination and order tracking, as it monitors and manages shipments of

Table 4. Results Summary

	Predictors	***β***	***(SE)***	***t***	***p***	***R***	***F***	R^2
1	*Path a* (IT—- SC agility)	.32	.058	5.597	.000	.34	31.33	.116
2	*Path b* (SC agility—- Cost Reduction)	.56	.070	7.923	.003	.52	45.14	.28
3	*Path c* (IT——Cost Reduction)	.33	.071	4.672	.001	.29	21.83	.084
4	*Path C'* (IT——Cost Reduction)	.15	.0678	2.227	.000	.52	45.14	.28
	Bootstrap result for indirect	**Effect**	**SE**	**LLCI**	**ULCI**			
	Supply chain agility	.1832	.061	.1068	.2758			

Note. Dependent Variable: Cost Reduction, LL = lower limit; CI = confidence interval; UL = upper limit. N = 240; Unstandardized regression coefficients are reported

Table 5. Hypothesis testing of relationship between it adoption, supply chain agility, and operation performance

	Predictors	*β*	*(SE)*	*t*	*p*	*R*	*F*	R^2
1	*Path a* (IT—- SC agility)	.32	.058	5.597	.000	.34	31.33	.116
2	*Path b* (SC agility—- Operational Performance)	.28	.063	4.456	.001	.61	66.97	.361
3	*Path c* (IT—-Operational Performance)	.60	.059	10.281	.000	.56	105.71	.307
4	*Path C′* (IT——Operational Performance)	.51	.060	8.520	.000	.61	66.97	.361
	Bootstrap result for indirect	**Effect**	**SE**	**LLCI**	**ULCI**			
	Supply chain agility	*.0910*	*.247*	*.0485*	*.1468*			

Note. Dependent Variable: Operational Performance *LL = lower limit; CI = confidence interval; UL = upper limit. N = 240; Unstandardized regression coefficients are reported*

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individual, confirming delivery of the product to the ultimate user without inaccuracies (Thapa, 2014). Information sharing brings benefits for supply chain partners by process alignment that is collaboration in the working areas like supplier's common system, product development, and sharing of information. Technologies help the organization to respond the market trend and keep updating the inventory system, forecasting the demand, transportation and reduce the supply lead time, packaging and communication channel. Communication is necessary, so that the employees are able to promptly recognize the resource that is used in supply chain process (S. Li & Lin, 2006). As the agility is the ability of firms to employs its knowledge and other collaborators to sustain the profitability in a dynamic market environment (Lee & Yang, 2008), IT provides number of solutions to encourage, update and reliability of information and communication (Dehgani & Navimipour, 2019) that is necessary for supply chain agility.

The real importance of technology in enhancing supply chain emerged during the COVID-19 period. The urgency of contactless transactions and businesses has highlighted the dependency on technology to remain agile especially in fast food industry. The pandemic has caused fast digital transformation across all sectors which makes it clear that business need technology to remain sustainable and competitive. Shipman (2020) poignantly said that "There have been, and will continue to be, many hard lessons learned in the world of supply chain management from COVID-19. One of those lessons is a sharp reminder that agility, adaptability and alignment win the day".

The fast food restaurant's employees today need to be conversant with tablets and the software they run. For communication purposes, they can be required to download staffing apps to their personal cell phones, or they might be required to purchase smartwatches so that cooks and other staff can respond to applications on a wearable device while keeping their hands free for work. A rising need exists for qualified managers to instruct, oversee, and maintain this pervasive restaurant technology. Additionally, managers have more data at their disposal to help them manage staff members and support their professional development. The ubiquitous use of order kiosks and, of course, apps are one of the most obvious examples of fast food automation. These are now widely used in restaurants to expedite the ordering process and give customers more customization with less hassle. Additionally, due to social distance during and after pandemic, many cafés, restaurants, and bars now use a combination of QR codes and applications to track and trace customers and as a tool for "direct-to-table" service to save unnecessary interaction and movement. Such increasing growth of technology both from employees and customer side improves the operational performance of fast food sector.

Fast food firms will be able to swiftly and effectively pivot and adapt to change if they can make their technology foundation nimble. Now the question arises that why companies' supply chain process needs to be agile. The answer lies in number of benefits offered by supply chain agility. Two of these important benefits are cost reduction and operational performance. The significant positive effect of supply chain agility on cost reduction and operational performance has been confirmed in this study. The cost reduction and operational performance is necessary to measure when supply chain agility is calculated, as "the operations cost in a fast-food organization depends upon how accurately the costing strategies are applied. If the cost control strategies are applied with-out considering the operational side of the organization it will have negative results on revenue" (UKEssays, November 2018). Along with it, food sector has characteristics of being labor intensive, risk of food perishability, changed menus/productions and demand hours which create many challenges in operations management leading to high labor and high cost (Kanyan et al., 2016).

Shahid and Khan (2016) stated that "operational elements are those activities service providers perform that contribute to consistent quality, productivity and efficiency. These comprise the physical features of the service, that is, the characteristics of delivery that define and capture form, time and place. Operational service, for example, consists of elements such as product availability, product

condition, delivery reliability and delivery speed". In fast food restaurants operations such as personnel, customer, inventory, and workflow control must be managed in order to maintain operational efficiency. On any given day, restaurants must manage numerous concurrent operations, from tracking sales to organising the logistics of vendor procurement. This might grow overwhelming if typical administrative techniques were used. However, restaurants may improve operational efficiency with management software to lower costs and boost productivity and profits. Hence, technologies keep them agile and improve their operational efficiency.

Clarke (2021) discussed Mcdonald's agility strategy by identifying that due to Covid constraints, they had to update their online ordering application and add click and serve and drive-thru collection to its list of features. With 15% of its orders coming from applications, McDonald's has been able to expand despite the restaurant business being destroyed by lockdown. This has been made significantly easier by adopting agility in technology and digital products. He further stressed that adopting and practicing an agile attitude in fast food company will enable to adapt to any market and, adopting and practicing an agile attitude in the company will enable to adapt to any market and, if they are like McDonald's, thrive in a pandemic Clarke, 2021. This assumption has been supported in this study as well.

The testing of supply chain agility as a mediator between IT adoption and cost reduction and operational performance confirmed that if a firm adopts latest and advanced technologies, it can help to achieve supply chain agility and when supply chain agility is achieved, it can help fast food firms in reducing cost and improving operational performance. Overall, IT adoption helps to remain alert, updates quick information, helps in collaboration and integration not only with suppliers but with customers as well, helps to achieve sustainable business performance, reduce inventory and all other operational cost by improving accuracy in operations.

The research yields important insights from both managerial and theoretical perspectives. As the understanding of supply chain management in fast food industry with particular focus in developing country is very low (Hanif & Usman, 2018), therefore, this study has made an attempt to fill the literature gap. Based on dynamic capability view theory, it enriches the literature by identifying two major capabilities of firms, i.e., IT and agility through which firms can gain organizational competence. The study makes another contribution of testing one capability as outcomes of other capability, i.e., supply chain agility as an outcome of IT capability. This adds to the theory of dynamic capability view that firm's capabilities may impact on firm performance in both direct and indirect ways and that one capability may lead to another capability that can ultimately yield benefits for the firms.

From a managerial point of view, the findings of the current study indicate that firms should adopt latest technologies by collaborating with IT companies to fulfill their business demand. Moreover, the results support the notion that managers or firms who can exploit the latest technologies can build agile supply chain in their business to gain competitive edge. There are many advanced technologies that can be used in supply chain like big data, blockchain, artificial intelligence, and internet of things. This requires a comprehensive understanding of such technologies to reap benefits. As the study sample in this research included medium- and large-sized fast food chains; hence, variations of usage level of technology were found. Usually small- and medium-sized firms face the issues of less resources and service optimization than compare to big brands such as Mcdonald's and KFC. Although restaurants are using technology more and more into their operations, there is still space for expansion in this sector. Restaurant owners should keep investing in new technologies to stay current with or even ahead of industry trends in order to match the continuously changing demands of customers and run a more effective business. A successful supply chain is one in which the proper things are delivered precisely at the right time and in the right amount. This operational efficiency and performance can be best achieved with the help of technology.

5.1. Conclusion, limitations, and directions for future research

The recent advances in technologies have brought tremendous opportunities for business to enhance their supply chain systems to remain competitive in market. The study strongly advocates the use of latest technologies to have an agile supply chain that is the need of today's time. The recent pandemic of COVID-19 has turned the heat for agile supply chain around the world. This imposes a need for businesses to think and act innovatively. The study confirms that IT adoption brings the desired benefits of supply chain agility which in turn aids cost reduction and improves operational performance of firms. As Roffman (2020) poignantly said, "As no one could have predicted the COVID-19 pandemic, no one can predict the next major supply chain disruptor. The only thing you can do is prepare for impact so you can meet new demands—whether entering new markets, addressing evolving customer and regulatory requirements, or dealing with unforeseen global changes".

5.2. Limitations and future directions

The study has some limitations including the sample which was selected from few cities of Pakistan that would restrict the generalizability of results. Additionally, the study findings are generalizable to only the fast food sector of Pakistan. The current research only used few variables that might not provide a comprehensive view of other factors (efficiency, quality, organization performance). Moreover, the study design was cross-sectional in nature, which measures the static relationships among variables. The current study adopted a survey research design to reflect managerial perspectives.

Future studies could apply the current study's model to other geographical settings. Future studies could also test the same model in other food or relevant sector. Longitudinal studies exploring multiple dimensions of supply chain agility and its multiple outcomes are also recommended in the future studies. The effects of specific technologies such as big data, ERP, or any other software could be checked separately. Similarly, to get an insight into supply chain agility, different dimensions of it should be studied. Future research can improve the methodology and findings by extracting data from quarterly and annually reports to report specific performance data objectively. In the light of study findings of Gharaei, Diallo et al. (2022), sustainable supply chain and its "environmental impacts such as water usage is strongly recommended as an additional direction for future research".

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