



THE ROLE OF ARTIFICIAL INTELLIGENCE (AI) IN SHAPING SUSTAINABLE AND RESILIENT DIGITAL SUPPLY CHAINS

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Abstract

Purpose

This research investigates the importance of advanced digital policy which have been use in the supply chain management globally. It investigates Capability of data analytics internally, External data analytics, Capability of procurement digitally, Automation, End to End Visibility their role in digital supply and by this how it contributes to business performance and its flexibility.

Design/Methodology/Approach

The method of collecting data by using the Questionnaires and collecting their responses in identifying their thoughts about the digital supply chain through digital platforms.

Findings

We have 12 tested hypotheses, which showed the results we found that our results do not support 6 which includes 3 direct 2 mediating and 1 moderating. It includes capability of procurement digitally and Supply chain digital, internal data analytics and Supply chain digital, End to End visibility and Supply chain digital. 2 mediating which includes Automation, Supply chain digitally and Business performance, End to End Visibility, Supply chain digitally and business performance. 1 moderating which includes prior to digital platforms that moderates with Supply chain digitally and business performance.

Research Limitations / Implications



The current research gives helpful details to those working in logistics firm. It can help some small Logistics firms to switch towards digital supply chain. By using modernized techniques it can help them in improving organizational performances. This can lead to smart supply chain and can go to next level.

Originality/Value

We have analysed the moderated effects of prior to digital platforms between the digital supply chain.

Key Words Digital supply chain, SCM, SME, Big Data Analytics, Business performance

Paper Type : Research Paper

Introduction

As an outcome of digitization the interaction and communication in Supply chain firms globally of the people with in their gatherings have changed. The method of retrieving and distributing information has been transformed through cutting edge devices and technologies which includes like computers, smart phones, cars driverless, and smart wearable devices (S. Khan, Badar, Khan, & Zaman). These oddities and advanced changes influence each industrial sectors, and supply chain are no special case. According to (Alkan & Kahraman, 2023), digitization of Supply chain now bound Innovative products and services as competent as the management of processes in Supply chain with in business going through these quick changes. In order to increase profit from the computerized production network, it is important to use novel methodologies, incorporating advanced change with innovations. This study characterizes the computerized store network as a heap of interconnected exercises, took care of with novel innovations, associated with production network processes among providers and clients. To put it another way, Supply chain digitally transformation is a novel ,intelligent, and addition of value process that creates competitive value and network effects by utilizing novel methods, particularly digital transformation with technologies (Jamil, Khan, & Zafar, 2022). Location, scanning through barcode with services based on in near field communication are just a few of the further features that businesses can take benefit as a result of their digital transformations. These exercises are made conceivable by savvy innovations a gathering of qualities implanted in gadgets that empower knowledge. These features allows the gadgets to be operational, obtainable, reasonable, transmittable, memorisable (C. Xu, Lam, Gao, & Chiu, 2023). As a result, the digital supply chain based on innovative technologies and transformation digitally is the core focus of the current study, which examines how digitalization will alter how business collaborate and interact (S. Khan et al.).

In running an entire supply chain, numerous researchers emphasized the importance of external and internal correlation performance. Examples include (S. A. R. Khan et al., 2022) found that service performance improves and total costs are reduced when supply chain participants collaborate more in addition, they discovered that ideal alliance starts with customers and expands throughout the company from dispersion of finished goods to manufacturing and acquisition of raw materials to collaboration with service and material suppliers all of these steps are the part of the same process. Collaboration with in supply chains has also increased as result of increased digital transformation, according to studies. Albeit many firms have



referenced and approved the extra ordinary capability of transforming digitally in supply chains, it stays significant undiscovered chance when comes to organizations trying to push towards computerized production network (S. Khan, Jamil, & Seraj, 2022). Digital transformation has not been shown to increase collaboration because of lack of evidence, there is a need of additional research into the role that smart innovative technologies play in supply chain digitally. Both Internal and External relationships are included in this study definition of relationship performance while the it focuses on the operational success with other member of Supply chain (Tana & Chai, 2023).

Objectives of Study

- To examine the digital supply chain with direct relationship with its tools how it has impact on business performance.
- To examine the role mediation of digital supply chain in between internal data analytics, External data analytics capability, Digital procurement capability, Automation, End to End visibility with Business performance.
- To examine the moderating effect of Prior to digital Platforms of business performance

Business Performance

An ever-increasing number of firms globally are starting to take on inventory network the board (SCM) to further develop exhibitions of their associations. It looks at how senior production or SCM managers feel about their companies SCM practices and results. Business performance depends on techniques use in an organization. Modern techniques can improve business performance e and can generate productivity (Yang, Yu, Umar, & Shah, 2022). It explicitly researches connection between SCM, store network adaptability and business execution and these affiliations are investigated through measurable strategies, for example Pearson relationship and primary condition demonstrating (SEM). The overall results suggests that supply chain flexibility and business performance are significantly correlated with supply chain management (Barakat et al., 2023). More specifically, there is a strong correlation between flexibility of supply chain and business performance and SCM, which include programs like strategic supplier partnership, lean production deferral concept innovation and technology. The SME results also demonstrates that new technology and innovation and lean production two supply chain proxies, appear to be of primarily importance and substantial influence on flexibility of Supply chain and business performance (Yu et al., 2021).

Theory Development and Literature Review

Digital platforms are technological intermediaries that make it possible for businesses to get together with international players in order to establish business networks appropriately and cross national borders. Research has shown advanced stages which are better at interacting with customers and providers, working with exchange, and creating commercial centres that are capable of handling huge scales (S. Khan & Sajjad, 2013). Generally, stages lay out a mechanized surroundings where diverse associations team up electronically to perceive likely accomplices. Mechanized stages for most part been researched with business to a client (B2C) setting out the advantages and focus that clients could achieve from the availability of various venders (Wang, Yang, Zhang, & Zhao, 2023). According to (Li, Lee, & Gharehgozli, 2023),



some main advantages of using policy in Supply Chain Management include lowering cost of transaction, increasing fairness, and sharing information. To do the assessment of platforms, businesses are supposed to give the majority of their corporate details, in addition to detailed product features or charts. An outstanding figure of this occurrence is the ELEMICA platform. All corporation are for sure look forward to give details regarding their ongoing circle back, normal conveyance time. Furthermore, delays, their own provider organization, input from current clients, and fastidious corporate information to get to this specific stage (S. Khan, Zaman, Khan, & Musleha, 2022).

Theory of Transaction Cost

In this research uses variety of business fields as they have paid a lot of attention to transaction cost theory TCT over the past ten years. Tragically the rich hypothetical base of TCT has been restricted implementation in tasks and production networks by the board research, by providing convincing synopsis of assumption build up and prepositions. It likewise sums up existing work administration and different disciplines that draws TCT point of view and analysed connections in assembling association. Afterward, data from 203 OEM electronic manufacturing companies are used to create a measurement model of transaction cost. So, transaction cost is associated with doing business which can be broken down into internal and external transaction expenses (Sherbaz, Maqsood, & Khan, 2015).

Theories of Resource Dependence

It is based on organization principle as business firm should take part in exchanges different associations in its current circumstance to procure assets. Firms have decisively utilized agreeable linkages to lay out intensity. Utilizing perspective of Resource dependence theory, we examined the ways in which firms decision regarding logistics integration are influenced by trust, satisfaction and commitment. Additionally, we investigate connection between supply chain performance and logical integration. The research demonstrated that manufacturing companies benefits from enhancing their supply chain business and operations performance by developing strategic relationships with logistics service providers (Freeman, Harrison, Wicks, Parmar, & de Colle, 2023).

Theory of Stakeholder (ST)

There are has been an empirical evidence which demonstrate stakeholder theory applies to SCM and has emerged as a central theorem in management theory and practice. This stakeholder theory is being examined. The make or buy sourcing strategy, supplier strategy and contracting decisions are then subjected to stakeholder theory. Stakeholders are found to be a part of SCM decision, and idea of stakeholder's salience can connect stakeholder theory and SCM decision making. Stakeholder in SCM plays a key role in accountability and control and they regulates the activities in an organization and role in decision making (Kim, Zhao, Kim, & Rhee, 2023).

Conceptual Framework and Hypothesis Development



The discussion based above we have proposed the model of 12 hypothesis which includes 6 direct, 5 indirect and 1 moderating The conceptual framework shows the developed hypothesis. Once the hypothesis will be developed the testing will be done to check the results.

Digital Supply Chain and Business Performance

Supply Chain process (SC) are being redefined by technological advancement, and conventional approaches to SC management will soon no longer be viable or efficient. Digitization in logistics firms globally has emerged as emerging topic among researchers and decision makers as a result of recent technological advancements in firms globally. Digital Supply Chains (DSCs) for better business performance must be adopted by businesses in order to keep up with trends which are emerging in customer behaviour and remain competitive (Si, Jalees, Zaman, Kazmi, & Khan, 2023). As a result, the aim of this article is twofold: To begin, to determine the essential DSC characteristics that are necessary for the conversion of conventional SCs to DSCs in order to enhance organizational performance. Secondly, interpretive structural modelling matrix impacts crossed multiplication applied to classification is used to determine the critical factors driving and dependent power and to establish the relationship between them. As a result, article determined the direct and indirect effects of fifteen critical DSC factors (Zaman, Khan, Zaman, & Khan, 2023). The results indicate that advanced models of operational and combination have the driving power factors which are highest while SC prevention is proactive and resilience have the power dependency factors. This can assist SC supervisors and chiefs to figure out the basic elements fundamental in taking on DSCs for working on authoritative execution (Zaman, Khan, & Khan).

H1. Digital supply chain positively influences Business performance

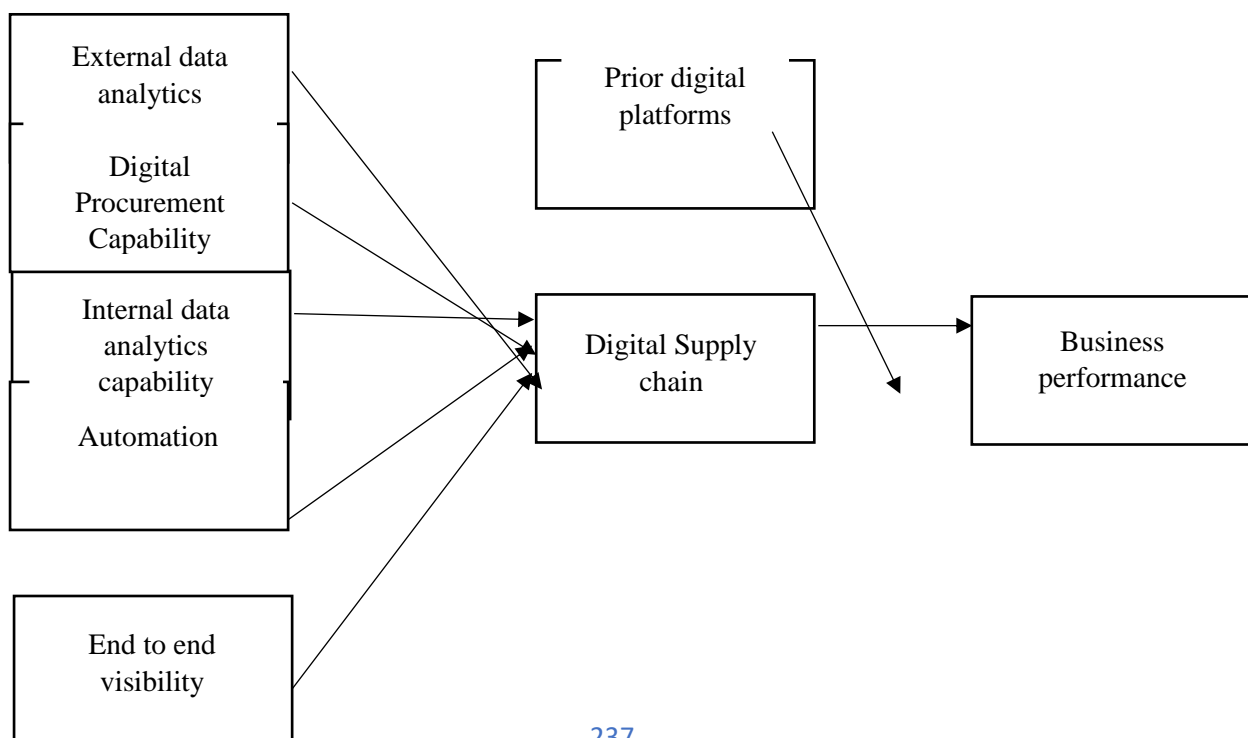




Figure 1. Conceptual Framework

External Data Analytics and Digital Supply Chain

A model of computer that constitutes states of network at any specified moment in a actual time is what we called A digital supply chain (SC) twin. When managing disruptive risks in CSS, we investigate the circumstances adjoining the implementation and design of digital twins. An external data protection is very important. A modern supply chain external data analytics is powerful and it can't disrupted it has strong privacy (Ivanov, 2023). The mix of model based and information operating approaches permits interrelations uncovering chances of information, disturbance displaying and execution appraisal. Digital twins are absolutely necessary for aligning supply networks and ensuring visibility, as evidenced by the SC shocks and adaptation during the Covid19 pandemic and post pandemic recoveries (Phillips, Taylor, Boniface, & SurrIDGE, 2023). The consequences of this study add to examination and use of SC risk the executives by upgrading prescient and receptive choices to use the upside of SC representation, verifiable disturbance information examination, and ongoing interruption information and guarantee starts to finish comprehensibly and business coherence in worldwide organization. So External Data must be protected as it plays key role in digital supply chain management (Ishizaka, Khan, Kheybari, & Zaman, 2023).

H2. The External Data Analytics Capability positively influences Digital Supply Chain

H3. The Digital supply chain mediates the External data analytics Capability and Business performance

Digital Procurement Capability and Digital Supply Chain

For modern businesses the procurement is considered as a core area of focus. In order to stay competitive and productive in terms of cost in an environment marked by rising competition globally and decreasing margins of profits. This is especially valid for assembling firms who disperse 80% of their incomes on the acquisition of items and administrations (B. Khan, Aqil, Alam Kazmi, & Zaman, 2023). Manufacturing companies operating internationally have taken a number of steps to smooth up the function of procurement and the entire value chain in an effort to proactive upgrade their functioning in response to cost and revenue pressures (Anttila, 2023). Implementing technological innovations like electronic procurement is one of such measure. Electronic procurement has been implemented by Dell, GE, Cisco systems IBM and Wall mart, all of which have been seen significant financial benefits. The utilization of obtainment applications has permitted these organization to accomplish many advantages including diminished process duration and cost, further developed precision, better coordination with accomplices, and upgraded monetary execution (Miao, Jalees, Qabool, & Zaman, 2020).

Despite the fact that current research has examined the procedure of procurement and application of cutting-edge information technologies in great depth, capabilities that facilitate process performance enhancements have received relatively little research attention. To separate the appliance for creation of value in processes of business, it is essential to place a focus on capability of organization, which is defined as an organizations capacity to perform a



task which links its capacity for creating value repeatedly and reliably (Miao et al., 2022). Organizations develop and utilize new capabilities that require in-depth investigation as information systems which are innovative are progressively used in novel ways to create value in processes of businesses which are interconnected. It is essential to take note of that these abilities are relevant at various levels. For example, a few capacities might apply at the level of the whole cycle for example, strategies stock administration and obtainment, through others might be relevant at the level of engaged errand, for example, looking, requesting, billing and restocking (Mubarik, Kazmi, & Zaman, 2021). In addition, some competence may be authorize by technology, while others may either precede.

H4. Digital procurement capability positively influences digital supply chain.

H5. Digital Supply Chain mediates the digital procurement capability and business performance.

Internal Data Analytic and Digital Supply Chain

Analytics tools and methods are used to analyse and interpret the data from various supply chain source in internal data analytics in digital supply chain. The information can incorporate data about stock levels, creation yield, transportation plan, and client interest and so on. In digital supply chain internal data analytics can help businesses identify the area of risk and potential supply chain disruptions in addition to increasing operational efficiency (Tiwari, Wee, & Daryanto, 2018). Organizations can anticipate potential issues and implement proactive solutions to void delays or disruptions by analysing data from the supply chain. This review creates and experimental test a hypothetical structure in view of hierarchical data handling hypothesis that explores the impact of information driven culture and huge examination capacity (BDAC) on SCF reconciliation. With crucial review data gathered from example of 307 assembling companies in China, the conjectured connections were tested underlining condition demonstrating and direct relapse examination. It indicates that BDAC and SCF integration fully in mediates relationships that BDAC and SCF interrelation have with suppliers and customers (Nazir et al., 2023). A culture of driven data remarkably moderates the impact of BDAC on internal SCF integration. Internal data analytics within an organization is a key factor as it needs to get extracted with in the operations. Data driven culture and big data Analytics can be used by managers to apply SCF practices integrated in today's data wealthy and undetermined environment. So overall any business that wants to boost productivity and efficiency in its supply chain operations it needs to use internal data analytics. It can assist organization organizations with distinguishing potential open doors for cost reserve funds, further develop client car, and gain an upper hand in an undeniably mind boggling and dynamic business climate (Zaman, Khan, Zaman, et al., 2023).

H6. Internal data analytics positively influences the digital supply chain

H7. Digital supply mediates the internal data analytics and business performance.

Automation and Digital Supply Chain

The automation in supply chain plays a major part as Store network. The board (SCM) is perhaps of the most difficult field which underscores connections among various areas,



essentially promoting strategies and creation. In this manner, outcome in SCM lies in the general progress of any business. However, due to globalization, adverse events like frequent natural disasters, instability politically and compatible changes in business practices like lean management and just in time logistics, SCM must always come up with good way to deal with these problems (Pal, 2023). Lately advancements like man made reasoning (artificial intelligence) is been demonstrated massively important to SC.

It recognizes the automation of added substance fabricating innovation utilizing web of thing (IOT) will use the nature of existing production network the board processes. The significance of the execution of e coordinated factors in production network activities is additionally portrayed. A serious work area based writing overview concentrate on recognizes expected benefits of integrating IOT computerized added substance assembling to further develop inventory network processes (Zaman & Kusi-Sarpong, 2023). The mechanization of coordinated factors tasks, otherwise e strategies, will assist with modernizing inventory network the board. The exploration paper contains hypothetical work about the use of mechanized added substance assembling and e operations in current stock chains. Supply chains are incorporating robotic process which includes artificial intelligence, machine learning, automation, digital twins, augmented reality, and other technologies digital based introduced as a part of the 4th industrial revolution to lower production costs overall. Supply chain automation being adopted by the best businesses to reduce operational costs and eliminate shortage (P. Xu, Xu, & Bao, 2023).

H8. Automation positively influences the digital supply chain

H9. Digital supply chain mediates the automation and firm performance

End to End Visibility and Digital Supply Chain

Current stockpile chains were planned in a time of lean administration and globalization and globalization, what's more, they presently face the test of adjusting to these progressive patterns. These supply chains lack adaptability and resilience due to their predominantly static structures. These End to End Visibility in digital supply chain will help to give aggregate view from the procurement to the end consumer (Ivanov, 2023). Despite this, the transformations have begun and must be thoroughly examined in order to help shape the supply chains of the future. Considering the Coronavirus dish pandemic, scientists and experts have become progressively inspired by the worth of advanced innovations for store network finish visibility and its likely purposes to increment flexibility (Saini, Malik, & Sharma, 2023). Visibility should be visible as both a capacity and a result. From the perspective capacity, we define end to end chain visibility as the capacity to digitally constitute supply chain physically with all accurate data that can be collected, refined updated and assessed in actual time to support drafting, observing, and authorize decision making. This tool basically has created an impact on companies as the companies have adapted End to End Visibility. As a result, a digital replication of a real world supply chain is created with visibility throughout the entire supply chain (Zaman, Khan, Qabool, & Gupta, 2023).



Many businesses and supply chain operational conditions have been drastically altered by the Covid19 pandemic. Companies have been enforced to acquire how to function in an environment that is extremely unstable and unpredictable. One of the most important perspectives on supply chain management has been the idea of resilience which businesses have dealt with extensively during the pandemic. This brings up the issue of how these examples from the pandemic can be utilized in post Coronavirus production network the executives. Some recent research has hypnotised that digital technology plays a key role in creation of new knowledge regarding supply chain resilience to pandemics (Gatenholm & Halldórsson, 2023).

H10. End to End Visibility positively influences the digital supply chain.

H11. Digital supply chain mediates the End to End Visibility and business performance.

Prior Digital Platforms

Prior to digital innovation in supply chain there were traditional methods used for supply chain? They used to operate on the rules of previous transaction. Prior to digital platforms most of the time standalone systems were used in old traditional supply chain which worked in silos with no proper data sharing. Processes that take a product from the raw materials accession to production and delivery to final consumer are included in these supply chains. Prior to digital platforms common methods were used which were not as productive as after digital tools in supply chain (Ali & Govindan, 2023). Costmary stock pile chains and SCM centre on creation and arrangement, as opposed to on client needs. Additionally, they lack the intelligence to quickly identify issues throughout the value chain and are not optimized. Majority of businesses have focused on the efficiency and effectiveness of individual business functions over time. As a better approach for carrying on with work , in any case, number of firms who have started to develop have realized the importance of controlling, planning and arranging network of production overall (Niranjan, Rajak, & Parthiban, 2023). With an end goal to assist firms and catching with cooperative energy of between hierarchical incorporation coordination across the inventory network and to thusly pursue better production network choices. We like ways give different rules to effective turn of events and execution of inventory models. Predicting its likely effects and finding a solution took a lot of time and effort even after a problem found. That defers creation, presents, blunders and builds an opportunity to showcase all of which can hurt consumer loyalty and corporate benefits (Zaman et al.).

H12. Prior to Digital Platforms moderates Digital Supply Chain and Business Performance

Methodology

Data Collection and Procedure

In this we are targeting the business universities of Pakistan however study sample size was 260 we got 259 responses we have collected the data from Education institutions and several individuals who have shown the interest in digital supply chain management and have shown responses. In this we have collected through Questionnaires and we got responses which is 259.



This is an accepted rate of response collected.

The Stimulus for the Study

In studies conducted in past many respondents opinions have been used In that stimuli's were not mentioned. In this our stimuli is technology. We selected technology as stimuli because new generation prefer to technology to get work done in logistics in a short time instead of long process.

Common Method Bias

This study follows a proper protocol as required to conduct a research and it reduces the chances of biases. As it constructs proper framework based on modifying the scales and measurability.

Questionnaires Design

In this we have made the Ordinal data based on the surveys. As we have built the questionnaires related to 5 parts which includes Strongly Agree, Agree, Somewhat agree, Disagree, Strongly Disagree. It includes 8 factors and 25 items which are measured on five points rating scale.

Scales and Measurements

We grasp the constructs from earlier studies related to this field. In below it shows the sources constructs from which Questionnaires items have been designed. Below the questionnaires have been given.

Respondents Characteristics

In this we have built the questionnaires and have distributed to many individuals especially the students, professionals. We have distributed in many different universities especially leading business schools. The reason was to identify the age groups view regarding the digital transformation in supply chain management. So after giving questionnaires we collected 259 responses. In this When it comes to Gender it shows that 54 % male responded and 46 % of female responded. In the age brackets it shows that from 15-25 Age group there were 70% of respondents due to the students of different universities who responded. In 30-40 age group there were around 23% of respondents and in 45-50 age group there were 7% of respondents. When it comes to the level of education when it comes to A levels there were around 15% of respondents. In bachelors it showed the hike which is 72% of respondents due to Universities students. In Masters there were 13% of respondents. So the below table shows the Information. In the below table it shows the Characteristics Frequency and percentage of the respondents who showed interest in digital supply chain



Characteristics	Frequency	Percentage
Gender		
Male	140	54
Female	119	46
Age		
15-25	181	70
30-40	60	23
45-50	18	7
Level of education		
A level	39	15
Bachelor	186	72
Master	34	13

Table 1. Respondent's profile

Results

Descriptive Analysis

This section study has analyse the rationality and accuracy, an analysis has been done sum up in Table.

As the results shows the highest Cronbach's value of Alpha is Prior to digital platforms(Mean -0.020, a 0.860), and the lowest is for End to End Visibility (Mean 0.278 , α 0.730), preferring bearable rationality of building up the set of data collected from Pakistan largest city Karachi. The results shows all values are composite and are greater than 0.70, the values of AVE are higher than 0.60, approving that builds up don't diverge from the convergent authenticity requirement.

Discriminant Validity

Current study has used some criteria for the evaluation of discriminant validity. The results summary is figured in table. Results show that AVE values square roots are higher than the values of correlation, suggesting the build-up used in study are distinctive and clear. Study has proposed six direct five mediating and one moderating hypotheses. The current study tested the hypotheses based on the framework. The outcomes linked to hypotheses are shown in Table , and structural models and measurements models in Figures .The results support all the hypotheses which are direct excluding the following three (1) Digital Procurement Capability (β 5 0.194, t 5 2.444 , $p > 0.05$) and (2) Internal Data Analytics Capability (β 5 -0.078, t 5 1.070 , $p > 0.05$).(3) End To End Visibility (β 5 0.407, t 5 6.032 , $p > 0.05$) Of the hypothesis which are mediating, our results do not supports following 2 hypotheses: (1) Digital Supply Chain mediates Automation and Business Performance (β 0.007 , t 0.511 , $p > 0.05$) and (2) Digital Supply Chain mediates End To End Visibility and Business Performance (β 0.086 , t 3.198 , $p > 0.05$). Similar to those relationships who are moderating. Our results do not support the



moderating relationship following. Prior to digital platforms moderates Digital Supply Chain and Business Performance (β -0.021, t 0.963, $p > 0.05$).

Discussion

	Cronbach's alpha	Composite reliability	Mean
AVE			
Automation	0.765	0.865	0.681
Business performance	0.805	0.885	0.719
Digital procurement Capability	0.770	0.867	0.685
Digital supply chain	0.781	0.872	0.694
End to End Visibility	0.730	0.848	0.653
External Data Analytics	0.744	0.856	0.665
Internal Data Analytics Capability	0.779	0.871	0.693
Prior digital platforms	0.860	0.915	0.781

Table 2. Descriptive Analysis

Discriminant Validity

	Automation	Business Performance	Digital Procurement Capability	Digital Supply chain	End to end Visibility	External Data Analytics	Internal Data Analytics Capability	Prior Digital Platforms	Prior Digital Platforms x Digital Supply chain
Automation									
Business Performance	0.764								
Digital Procurement Capability	0.944	0.793							
Digital Supply chain	0.726	0.805	0.796						
End to end Visibility	0.877	0.971	0.815	0.873					



External Data Analytics	0.90	0.891	1.051	0.848	0.849			
Internal Data Analytics Capability	0.99	0.891	0.971	0.714	0.888	0.961		
Prior Digital Platforms	0.72	0.910	0.672	0.842	0.916	0.818	0.789	
Prior Digital Platforms x Digital Supply chain	0.19	0.188	0.261	0.361	0.230	0.215	0.325	0.123

Table 3. Discriminant Validity

Hypothesis Results

	beta	T stats	Pvalues	Results
Digital Supply Chain → Business Performance (H1)	0.213	4.224	0.000	Accepted
External Data Analytics → Digital Supply Chain (H2)	0.278	4.173	0.000	Accepted
External Data Analytics. Digital Supply Chain → Business Performance (H3)	0.059	2.708	0.007	Rejected
Digital Procurement Capability → Digital Supply Chain(H4)	0.194	2.444	0.015	Accepted
Digital Procurement Capability → Digital Supply Chain → Business Performance (H5)	0.041	2.337	0.019	Accepted
Internal Data Analytics Capability → Digital Supply Chain (H6)	-0.078	1.070	0.285	Rejected
Internal Data Analytics Capability → Digital Supply Chain → Business Performance. (H7)	-0.017	1.014	0.310	Accepted
Automation → Digital Supply Chain (H8)	0.033	0.532	0.595	Accepted



Automation → Digital Supply Chain → Business Performance (H9)	0.007	0.511	0.609	Rejected
End To End Visibility → Digital Supply Chain (H10)	0.407	6.032	0.000	Rejected
End To End Visibility → Digital Supply Chain → Business Performance (H11)	0.086	3.198	0.001	Rejected
Prior Digital Platforms → Digital Supply Chain → Business Performance (H12)	-0.021	0.963	0.336	Rejected

Note: Moderating relationships

Table 4 Hypothesis Results

The table shows the hypothesis influence on each variables with their results. As in H1 it shows positive influence on digital supply chain and business performance. As Digital supply chains (DSCs) for improved organizational performance must be adopted by businesses to keep up with this emerging trends in behaviour customer and remain competitive. Thus successful logistics firms focuses on Digital Supply Chain which has long lasting and positive impact on business performance the study found that H2 External Data Analytic Capability shows positive influence on the digital supply chain but on the other hand H3 Digital Supply Chain plays mediating role in between External Data Analytics and Business Performance. As managing disruptive risks in CSS, we investigate the circumstances surrounding the design and implementation of digital twins (Ivanov, 2023). These findings align as in H4 it shows the Digital procurement Capability positively influences on the Digital supply chain thus it also shows in H5 Digital supply chain plays a mediator role mediating in between Digital procurement Capability and business performance. As Manufacturing companies have taken a number of steps to shape up and modernize the procurement function and the chain value completely in an effort to proactive improve their operations in response to cost and revenue pressures (S. Khan et al.). In H6 It shows the Internal data Analytics positively influences the Digital supply chain, thus in H7 Digital supply chain plays a mediating role in between Internal data analytics and business performance. In digital supply chain internal data analytics can help businesses identify the area of risk and potential supply chain disruptions in addition to increasing operational efficiency. In H8 Automation positively influences the digital supply chain, thus in H9 Digital supply chain plays a mediating role in between Automation and business performance. Automation of added substance fabricating innovation utilizing web of thing (IOT) will use the nature of existing production network the board processes. In H10 it shows End to End Visibility positively influences the digital supply chain, thus in H11 Digital supply chain plays a mediating role in between End to End Visibility and Business performance. End to end chain visibility has capacity for physical representation of Supply Chain with all data that is applicable could be collected, evaluated, processed in actual time to support monitoring, control the decision making and support the planning. In H12 Prior to



digital platforms plays a role of moderator moderating Digital supply chain and business performance. Prior to digital innovation in supply chain there were traditional methods used for supply chain? They used to operate on the rules of previous transaction. These are the results of hypothesis been tested and it shows the clear picture.

Measurement Model

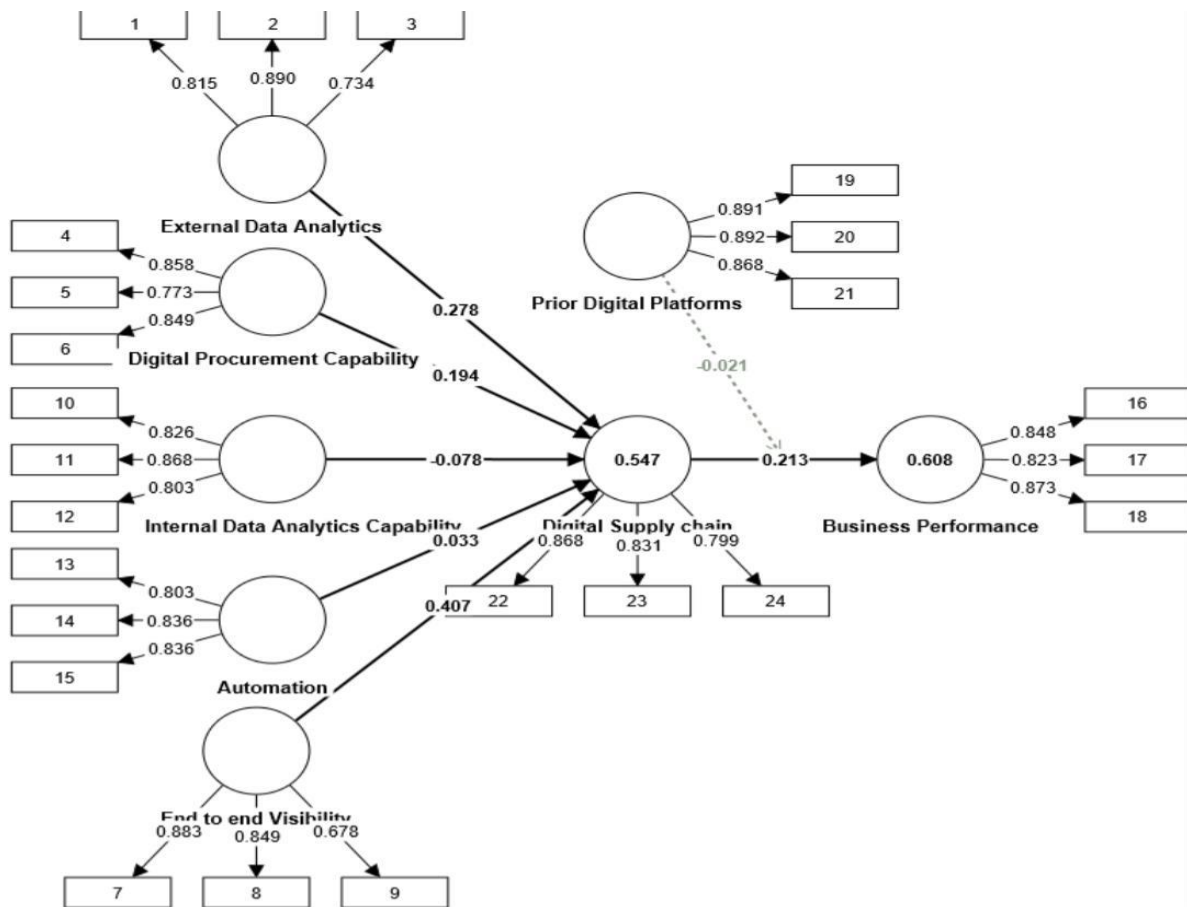


Figure 2. Measurement Model Structural Model

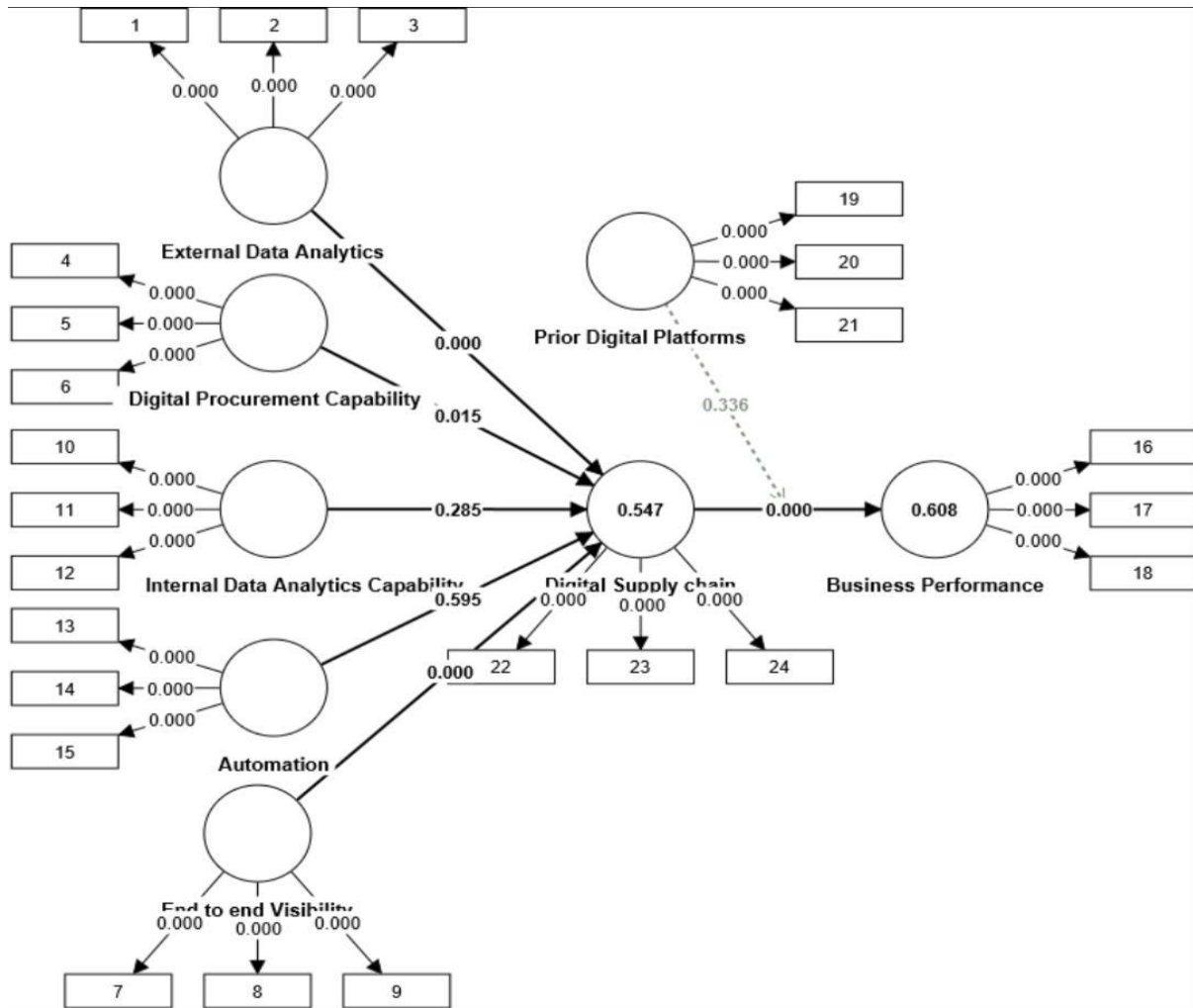


Figure 3. Structural Model

Conclusion

This study has shown support through its framework in order to examine the Business performance through digital supply chain. It shows all the theories, which supports the supply chain transformation. It has examined all the factors which includes, External Data Analytics, Internal data Analytics Capability, Automation, Digital Procurement Capability, End to End Visibility and how these digital platforms in supply chain helps to improve business performance. The Study has also examined the role of moderating of prior to digital platforms on Business performance. In this it showed the data which has been received after responses from individuals with different groups. The findings suggested the hypothesis of results on variables. As hypothesis were developed and their results were conducted accordingly. We have done the descriptive analysis in detail and checked the Validity of analysis. In this we have shown the results which we have tested on and collection of data following the protocols



of the research. In this we have shown the respondents characteristics which shows the Frequency and its percentage to identify that how much no of respondents responded to the questionnaires been provided. So overall research concludes that these digital tools plays a major role in transformation of industry which includes the supply chain. Successful logistics firms globally uses these digital tools for transforming their firms and long term growth and to improve organizational performance. In this we analyse the importance of digital platforms as instead of traditional method been use which is costly and time consuming we use these modern method to make cost effective and less time consuming due to technology and these modern methods are adopted globally in supply chain which are digital. So altogether we came to know that digital platforms has played a crucial role in transforming the supply chain into modern supply chain and it can help to increase more productivity, sustainability and long term growth for the logistics firms who have adapted and have switched to digital supply chain.

Theoretical Implications

Currently, the study value added to the theories through their framework of this study . It helps to prescribe different tools of digital supply chain and their impact on each of the variables on business performance. With the incorporate of theories like TC, RD, SD these type of combinations are been used in field of supply chain.

Different Research studies used this kind of TC RD SD kind of theories as they basically are the model in these literatures. These types of theories use in these studies are to give more significant results. Current study basically investigate business performances based on the digital supply chain tools . It also investigates moderating effect of prior to digital platforms which brings in further into an issue.

So different kind of theories are been used in supply chain. These theories are been used in various studies which have been conducted by the researchers. These theories have been linked to digital supply chain as without these theories it is difficult to justify. These theories gives accurate results and is the model for the existing literatures.

Practical and Managerial Implications

The current study provides the contributions practically especially to those logistics firms globally who are transforming and moving towards digital supply chain. Small scale firms must pay attention to it. As adopting a digital tool in supply chain has been a need as moving towards modern supply chain and leaving old traditional methods. As logistics firms should a long term future and for that digital tools are necessary, as for supply it is cost effective and less time consuming and distribution is done through modern techniques.

This study basically suggest Automation promotes the digital supply chain in terms of modernizing the technology. However, big data security also plays a key part in logistics firms, especially in digital supply chain as it should be protected internally and externally. This study focused on procurement which is through electronic procurement. There should be more implementation of Digital procurement, following all their stages which comes in process of digital procurement.



Digital supply chain can gain more attention and trust especially from customers, as they would always prefer their services to be done in less amount of time. Thus, it needs a bit more marketing, as logistics firms must use through different websites and show them their way of delivering the services and show their customers that how they have transform and the level of satisfaction which they gained, over a period of time. The customer feedback plays a crucial role in it as, by their feedback firms get to know about what they want.

Digital tools can help in increasing the profit as through long term procedures you get the things done quickly and you can save the cost. These elements of 5 digital tools describe in this study can help in making of successful logistics firms if the proper implementation is been done in the process. As Customers will have more trust on this modern supply chain management with fast services and for an organization it can bear fruitful results as it can change the organizational structure of working there will me more productivity which can been seen which is beneficial for an organization especially the logistics one which are operating in Pakistan.

The result shows that internal data analytics capability significantly influences the digital supply chain which means that it needs to be be maintained internal data analytics capability is very much important so it should be protected. Th digital supply chain should ensure that their growth of logistics firms depends on each and every tools.

The customer satisfaction level could increase if they get their orders and services according to the time frame given by the logistics firms. The more the time consuming procedure slow services in dealing the trust from customers to its firm would decrease. Logistics firms can encourage more customers to avail their services and promote long lasting relationships with customers. They must ensure that the customers don't feel the same as prior to digital platforms they must know that new technology in supply chain has change the structure for its distribution process as compared to before. Digital supply chain can ensure in maintain their service and changing it from time to time and switch to different tools whenever they see that there is a need to adopting that technology. As build more trust in customer mind is the most important thing and to keep them aware of tools which they are using. In organization they must check the employee's adaptability to use these tools in helping the organization to improve their performances.

Limitations and Future Recommendations

The outcomes of this study in respective of what the outcome is it has some limitations as well as there should a work been done as in some results where there were rejections they should be improved. The results of the study are based in Karachi, Pakistan. Firstly Future researchers should expand their study into more cross study and comparative their framework for research to examine the business performance. Secondly, Sample size must be bigger as to make more generalizable study. Thirdly this study has not focused on some of the specific tools which could be adopted by researchers. The upcoming researchers should follow this model use this in different categories. Lastly researchers should look into some factors which significantly influence other variable which did not support the results. The areas should be worked. The



Future Researchers should consider other factors in respondent characteristics which includes income groups, employment status which are most potential factors which needs to be included. These are the things which we recommend our future researchers once they conduct the research. As Future researchers should explore the gaps which we have given so that the more work can be done in that area. The researchers in order to make a research more excellent they will have to look into framework and which links the research study and especially the results which hypothesis were conducted so that more effective results are means to more work has been done in that area.



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Appendix Questionnaires
External data Analytics Capability Ivanov, D., & Dolgui, A. (2021).
1 Digital twins are absolute necessary for mapping supply networks and Ensure Visibility.
2 External Data Protection a key in digital supply chain management
3 The mix model based and information driven approach permits uncovering interactions of disturbance display and Execution appraisal
Digital Procurement Capability (Barua et al., 2001, Frohlich, 2002, Mishra et al., 2007; 2010; Rai and Tang
Mishra, A. N., Devaraj, S., & Vaidyanathan, G. (2013).
1 For Modern business E Procurement has been key focus to remain cost effective and competitive in an environment.
2 Implementation of technological innovation like E electronic Procurement is one such measure.
3 Streaming procurement function a key step for improving operation in response to Cost and Revenue Pressure
Internal Data Analytics Yu, W., Wong, C. Y., Chavez, R., & Jacobs, M. A. (2021).
1 Internal can help businesses identifying area of risk and potential supply chain
2 A data driven culture can moderate impact of BDAC on Internal SCF integration
3 Internal Data Analytics can assist potential open doors for Cost Revenue Funds
Automation Dash, R., McMurtrey, M., Rebman, C., & Kar, U. K. (2019).
Ashima, R., Haleem, A., Bahl, S., Nandan, D., & Javaid, M. (2022).
1 Is Automation important as store network in supply chain
2 To further develop Inventory Network Processes IOT(Internet of Things) computerized added substance to be assembled
3 Lowering Production cost with incorporating robotic process Automation Artificial Intelligence, Digital Twins are introduced
End To End Visibility Ivanov, D. (2021).
(Arlinghaus et al.). 2019, Das et al.2019, Ivanov et al., Hofmann and Langner 2020, Doetzer and Pflaum 2021 2021b).
1 To increment flexibility advanced Innovation for store networks to finish Visibility
2 Digital Replication of real world supply chain is created with Visibility through out supply chain.
3 End to End Visibility a capacity to digitally represent physical supply chain and relevant data collection
Business Performance Arawati, A. G. U. S. (2011).
1 SCM, store network adaptability and business execution and these affiliations are investigated through measurable strategies
2 Supply chain flexibility and business performance are significantly correlated with supply chain management.



3 Technology and innovation and lean production two supply chain proxies, appear to be of primarily importance and have the greatest impact on supply chain flexibility and business performance.
Transnational supply chain (Akter et al., 2016; Büyüközkan and Göçer, 2018; Matt et al., 2015; Weichhart et al., 2016; Zhu et al., 2015).
1 Supply chain digitization now encompasses digital products and services as well as management of supply chain processes with in business
2 To profit from the computerized production network, it is important to use novel methodologies , incorporating advanced change with innovations.
3 The digital supply chain is a novel ,intelligent, and value added process that creates competitive value and network effects.
Prior to digital platforms Min, H., & Zhou, G. (2002).
1 Prior to digital platforms most of the time stand alone systems were used in old traditional supply chain .
2 Processes that take a product from the aquisition of raw materials to production and delivery to the final consumer
3 Developing number of firms have started to understand the importance of arranging ,controlling and planning a production network