

Impacts of COVID-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

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Abstract

The study investigates the effects of the pandemic brought about by COVID-19 on Ilocos businesses and establishments on its business operations and supply chain. The study participants were the 352 owners of micro, small, medium, and large businesses in Ilocos Norte, and they were selected using a convenience sampling technique. The study employed a quantitative research design, and the entrepreneurs were asked about the perceived impact of COVID-19 on the supply chain. Using descriptive statistics, the findings divulged that the impact of the COVID-19 pandemic on businesses ranged from retrenchment of employees, disruption in the supply chain, and temporary to permanent shutdown. The impact of the pandemic includes uncertainties, and the decline in productivity, demand, and sales. This study implies that COVID-19 significantly affects operations, primarily supply chain management. Numerous organizations are pursuing local sourcing as a result of supply chain disruptions.

Keywords: *Supply chain management, COVID-19 pandemic, business operations*



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INTRODUCTION

As a result of the fast spread of COVID-19 across six continents by the new coronavirus SARS-nCoV-2, numerous nations have proclaimed a state of health emergency. On March 11, 2020, the [World Health Organization \(2020\)](#), proclaimed the fast-spreading disease a pandemic. It urged governments to conduct preparation and reaction steps following the Global Strategic Preparedness and Response Plan ([Vasavada, 2020](#)). COVID-19 has disrupted worldwide economic activity across every economic sector and industry. The interruptions are primarily the result of worldwide lockdown measures established and executed as a health policy to limit the pandemic's impact on the human population. The COVID-19 lockdown measures have resulted in production halts, limitations on persons and goods movement, border closures, logistical challenges, and a reduction in trade and economic activity. According to [World Trade Organization \(n.d.\)](#), virtually all areas will see double-digit declines in trade volumes in 2020, with North America and Asia experiencing the worst export decline. Due to the intricacy of their value and supply chains, the manufacturing industry will be severely hurt. When the worldwide outbreak began in March 2020, supply chain (SC) management (SCM) faced significant challenges in meeting unexpected demand for specific items while simultaneously enforcing travel and manufacturing restrictions and is currently battling to recover ([Mazareanu, 2020](#)). Businesses adapt to the new circumstances and will undoubtedly face adjustments that will last long after the pandemic ends. Supply networks are a crucial component of how the economy functions, yet they are not typically readily apparent. These networks of buyers and sellers are ultimately responsible for transporting raw materials, intermediary items, and, ultimately, finished products to consumers and companies throughout the

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Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

globe. The majority of supply networks run smoothly behind the scenes, unseen by end customers. During the COVID-19 pandemic, however, this efficiency began to deteriorate as cascading supply chain difficulties caused by massive labor shortages took root. Lockdowns, including the shutdown of enterprises and remote operations, have impeded the movement of raw materials, personnel, and completed goods across the supply chain. The COVID-19 pandemic revealed unforeseen weaknesses, and as a result, several businesses have faced capacity shortages and losses. (Hosseini & Ivanov, 2021). There are numerous major explanations for the negative effects of COVID-19 on supply chain performance, including the supply chain's susceptibility to fast demand changes and its inability to adapt quickly enough. Due to these unanticipated disruptions, the expansion of COVID-19 has also greatly raised demand in many sectors of the economy. This has caused severe shortages and strained the supply systems involved. Disruptions at one or a few agencies can impact nearly the entire supply chain (Ho et al., 2015).

With the lockdown in place, critical to global supply chain activity, the transportation sector remained blocked mainly. Since March 2020, no fewer than 90 nations have enforced lockdowns, affecting around 3.9 billion people at their peak in April 2020. As a result, there were impediments to the smooth operation of global supply chains, which harmed global commercial and industrial activity.

The outbreak has affected the maritime sector, accounting for around 90% of worldwide commerce activity valued at over \$12 trillion. By implication, the World Commerce Organization (WTO) forecasts that global trade will contract by between 13% and 32% in volume terms by year-end 2021. Disruptions in supply chains have also impacted other industries, including manufacturing, retail, and construction.

Supply chain resilience is crucial for the Philippines' economic recovery, even more so that we are gradually approaching the post-pandemic period. A well-managed supply chain system provides increased efficiency, quality over quantity, improved customer relationships and service, a shorter production cycle, lower production costs, and an overall improvement in a company's financial performance.

COVID-19's introduction into Ilocos Norte and its ensuing consequences and repercussions have had a detrimental effect on enterprises, households, and the economy. The slowdown in retail and trade activity, which accounts for most completed goods flowing to ultimate consumers, has also impacted the manufacturing sector, particularly for non-essential commodities. Manufacturers and distributors in Ilocos Norte have struggled to replace or restock their inventory, equipment, and machinery due to global supply-chain disruptions. Importers and exporters of Iloko products have also encountered difficulties delivering or bringing in goods across most international borders. The seaports, which serve as the primary route for international trade, have been impacted by restrictions and the slowing of industrial activity in major trading partners.

The study aims to gauge the effectiveness of the pandemic on the supply chain in Ilocos Norte. Primarily it measured the impact of COVID-19 on the operations of micro, small, and medium enterprises situated in Ilocos Norte, Philippines. Also, it enumerated the mitigating measures that these businesses implemented to lessen the implications of the outbreak on the operations of their businesses. The purpose of this study is to explore and analyze the COVID-19 pandemic's impact on supply chains and to give insights and ideas for building resilience through increased visibility and responsiveness. To the best of our knowledge, there are relatively few studies on this topic that

Impacts of Covid-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

have predominantly employed bibliometric and network analysis to elucidate the present state of COVID-19-related supply chain management research. Existing studies often employ either a graphical framework to comprehend the present state of the art in pandemic supply chain management ([Cordeiro et al., 2021](#)) or network analysis to display graphical maps of a co-citation analysis of pandemic supply chain research ([Swanson & Santamaria, 2021](#)).

Research Objectives

This study generally tries to explore the effects of Covid 19 on to supply chain and business operations of MSMEs in Ilocos Norte.

Specifically, it will answer the following research questions:

1. What is the organizational profile of MSMEs in the province of Ilocos Norte in terms of:
 - a) Form of business
 - b) Years of existence
 - c) No. of employees
 - d) Type of business
2. What is the impact of Covid 19 on the business operations of MSMEs?
3. What is the impact of Covid 19 on to supply chain of MSMEs?
4. What are the mitigating measures that MSMEs implemented to lessen the effects of Covid 19?
5. Is there a significant difference in the size of business to the impact of Covid 19 on the supply chain of MSMEs?

LITERATURE REVIEW

Impact of the Pandemic on Global Supply Chains (GSCs)

A growing number of researchers have conducted comprehensive literature evaluations examining the effects of the COVID-19 pandemic on supply chain management from a variety of perspectives including supply chain sustainability, supply chain interruption, and recovery strategies ([Alam et al., 2021](#)). Industry 4.0, for example, supports holistic pre-disruption resilience measures to enable more effective proactive risk management in the face of COVID-19 ([Spieske & Birkel, 2021](#)), as well as the four broad recurring themes which were revealed in the published work investigating the impacts of the COVID-19 pandemic, namely resilience strategies, technology for resilience strategies, and supply chain sustainability ([Chowdhury et al., 2021](#)). The majority of the evaluated publications were mostly concerned with content analysis to explore components of the study connected to COVID-19 and supply chain management. Nonetheless, bibliometric literature evaluations examining supply chain management in the context of the COVID-19 pandemic are sparse ([Govindan et al., 2020](#)). Specifically, many of the studies have not evaluated COVID-19's impact on the supply chain from a more comprehensive viewpoint. The literature is still

Impacts of Covid-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

growing and scattered, making it difficult to comprehend what is occurring in academic practice from these previously published evaluations.

The COVID-19 pandemic is not the first tragedy to catastrophically impact GSCs. Several other natural disasters, like Japan's 2011 mega-earthquake, China's 2003 SARS pandemic, and Indonesia's 2004 tsunami, have resulted in parts and product shortages. It is worth mentioning that productivity recovers quickly from these calamities. Most catastrophes, such as earthquakes, tsunamis, nuclear or radiation mishaps, and conflicts, are often localized to specific geographic areas for brief periods. Within four months of its initial breakout, however, the COVID-19 virus had spread worldwide, putting billions of people under lockdown and absolute confinement and leading to the partial or complete collapse of major economic sectors. Additionally, there is no way to estimate when this pandemic will be contained; each contaminated place on the planet is unquestionably in danger of a fresh breakout.

In terms of SCM, the coronavirus outbreak is one of the most significant disruptions in recent decades, "breaking numerous global supply chains" ([Araz et al., 2020](#)), yet; it is not the industry's first catastrophe. Other disruptions include the 2011 Japanese Tsunami and its impact on the supply chain globally and other pandemic outbreaks like severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), or Ebola. Numerous studies have been conducted on supply chain and worldwide logistics during previous outbreaks ([Calnan et al., 2018](#)). [Queiroz et al. \(2020\)](#) believe that one of the primary research priorities for SCM during epidemic outbreaks should be sustainability. Apart from sustainability, it appears critical to leverage digital and technical approaches such as data analytics or digital manufacturing to improve operations and SCM during pandemic outbreaks.

According to the WTO, virtually all areas saw double-digit declines in trade volumes in 2020, with North America and Asia experiencing the worst export decline. Due to the intricacy of their value and supply chains, the electronics and automotive industries are severely hurt. COVID-19 also highlighted the vulnerability of the global food supply systems. According to the [World Food Programme \(2022\)](#), the pandemic, combined with the climate crisis, has pushed over 276 million people into severe hunger (up from 135 million in 2019) ([World Food Programme, 2022](#)). COVID-19 has substantial financial ramifications for trade and supply chains. According to the Institute of Shipping Economics and Logistics (ISL), the container throughput index, which tracks the daily movement of people and products through shipping ports, fell from 113.3 in January 2020 to 107.7 in May 2020 – a fall of 9.5 percent.

Additionally, the International Air Travel Association (IATA) reported that industry-wide air cargo tonne-kilometers (CTKs) decreased by 15.3 percent year on year in the three months ending April 2020. Additionally, freight quantities decreased, but a capacity shortage increased loads and yields. This means that COVID-19 has had a detrimental effect on sea and air freight transportation. According to the [United Nations \(n.d.\)](#), global commerce is expected to decrease by roughly 15% in 2020 due to substantially reduced global demand and disruptions to global supply chains.

The World Bank forecasted a 5.2 percent reduction in global GDP in 2020 due to COVID-19. This implies a 5.2 percent reduction in the quantity of global income and wealth available to finance production and consumption. In this context, a decline in global buying power translates into a decline in demand for commodities and a contraction of supply chain activity. COVID-19 will result

Impacts of Covid-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

in job losses, income reductions, and a fall in economic activity on a local level. As a result, families may want fewer items, impacting supply chain firms' performance.

Research Paradigm

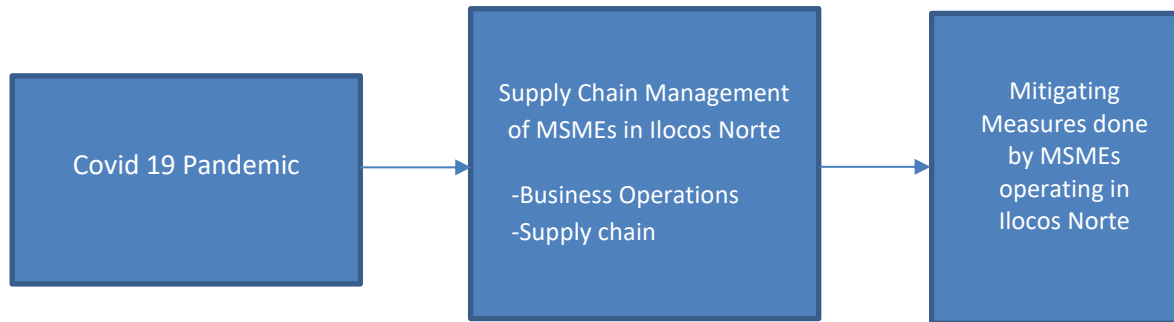


Figure 1. Research Paradigm

METHODOLOGY

Participants

The research design of this study is descriptive research. The participants of the study are the business owners of Ilocos Norte. Purposive nonprobability sampling was employed in this study. According to the Philippine Department of Trade and Industry (DTI), there are approximately 6000 business owners in Ilocos Norte. With this, using the Raosoft sampling size calculator, with a 95% level of confidence, the estimated sample size is 362. The survey questionnaires were delivered using Google Forms (electronically), and some were distributed personally. The questionnaire was also translated into the native Iloko dialect so the MSME owners who have a limited vocabulary in English could understand the questionnaire.

Research Instrument

The current study used a questionnaire as the research instrument. The instrument contained the organizational profile of the businesses – a form of business, years of existence, no. of employees, and type of business – and the items (measured using a 4-point Likert scale) for the latent variables – effects on business operations, effects on supply chain, mitigating measures and new workplace practices. The questionnaire was adopted from [Telukdarie et al. \(2020\)](#) study entitled Analysis of Covid 19 on the Food and Beverages Manufacturing Sector.

Data Analysis

The researcher used descriptive statistics in narrating the results of the study. Mostly the items were presented using frequency and percentages. Moreover, to measure the significant difference in the responses of micro, small, medium, and significant to the impact of Covid 19 pandemic on business operations and supply chain.

Ethical Considerations

Impacts of Covid-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

Ethical considerations are essential for this study, as all subjects have moral and legal rights. For this study, the researchers ensured that they communicated with the participants personally, that they did not intrude on their privacy without their permission, that the research did not damage their feelings, and that all details obtained from them were recognized and correctly portrayed. Moreover, participants received a letter of consent virtually outlining some of the core aspects of this analysis and what is required of both the participant and the researchers.

FINDINGS AND DISCUSSION

Organizational Profile of Respondents

Table 1. Organizational Profile of Respondents

Baseline Characteristics	n	%
Form of Business		
Microbusiness	190	54
Small Business	124	35.2
Medium Business	28	8
Large Business	10	2.8
Years of Existence		
Less than one year	108	30.7
1-5 years	144	40.9
6-10 years	33	9.4
11-15 years	12	3.4
More than 15 years	55	15.6
No. of Employees		
1-10 Employees	316	89.9
11-100 Employees	28	8
101-1000 Employees	5	1.4
More than 1000 Employees	3	9
Type of Business		
Sole Proprietorship	244	69.3
Partnership	65	18.5
Corporation	29	8.2
Cooperative	14	4

Table 1 shows the organizational profile of businesses. As gleaned from the table, most respondents (54%) are microbusinesses. This implies that most businesses established in Ilocos Norte are micro-businesses such as small eateries, sari-sari stores, and micro-manufacturing businesses. Also, as shown in the table, the majority of the respondents have been operating for 1-5 years (40.9%), which implies that most of the businesses are new in the line of business. Most of the businesses have 1-10 (89.8%) businesses aligned with the fact that most of them are microbusinesses. Lastly, they are primarily sole proprietors as to the type of business. This is also in conjunction with their being microbusinesses.

Impact of Covid on Business Operations

Impacts of Covid-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

Table 2. Impact of Covid 19 on Business Operations

Items	Mean	VI
We have completely closed our physical place of business.	2.62	MI
We have adjusted our hours of operation.	2.86	MI
Temporary shutdowns.	2.76	MI
Orders are being canceled.	2.61	MI
Our supply chain had been interrupted.	2.86	MI
We are experiencing decreases in sales.	3.15	MI
Employee absence due to sickness.	2.51	MI
Reduced logistics services	2.62	MI
The market is causing us to draw our line of credit.	2.61	MI
Increased administrative bottlenecks.	2.53	MI
We are experiencing increases in consumer demand for specific products.	2.70	MI
Overall Mean	2.71	MI

Legend:
 Highly Implemented (HI) 3.26-4.00
 Moderately Implemented (MI) 2.51-3.25
 Slightly Implemented (SI) 1.76-2.50
 Not Implemented (NI) 1.00-1.75

Table 2 shows the effects of the COVID-19 Pandemic on the business operations of the enterprises. Business operations cover the supply chain, hours of operations, sales operations, human resources, and other aspects of operations. The overall mean of 2.71 with a verbal interpretation of Moderate Impact indicates that enterprises in Ilocos Norte reasonably felt the pandemic's effects. The significant impact of COVID-19 on business operations is its decrease in sales ($x=3.15$). Many businesses in Ilocos Norte have experienced a decrease in sales because of the restrictions and protocols imposed by governing bodies. Micro and small businesses such as restaurants and sari-sari stores felt the decrease in their sales. For example, restaurants and eateries do not have customers because of the decrease in their customers who dine in. Sari-sari stores (neighborhood sundry stores) have limited customers because their usual customers are kids in the neighborhood.

However, because kids are prohibited from going out, their customers become limited. Also, enterprises adjusted their operation hours and interrupted supply chains ($x=2.86$). Mall operations and manufacturing companies' operation hours were shortened because of the local government units' health protocols and curfew hours in Ilocos Norte. Also, supply chains were interrupted. There were disruptions in the delivery of goods and services. The researchers interviewed some merchants, and they said that it is challenging to transport vegetables and meat products because there are police and military checkpoints at the borders of cities and

Impacts of Covid-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

municipalities. They also interviewed one poultry business owner, and he said that 2020 and 2021 were the hardest in his business operations.

Another effect of the pandemic was the permanent shutdowns ($x=2.68$) and temporary shutdowns ($x=2.86$) of some businesses in the locality. As observed by the researchers, most of those who permanently closed down their businesses are eateries, carinderias, and computer shops. In other words, the most affected by the pandemic are microbusinesses and small businesses.

However, the positive effect of COVID-19 was that some businesses' demand increased significantly for health products. Consumers became more health-conscious, and they bought vitamins and other supplements to boost their immune systems. This pandemic positively impacts pharmacies and drug stores. The researchers interviewed the owners of these drug stores, and they claim that their sales increased by as much as 40%.

Impact of Covid on Supply Chain

Table 3. Impact of Covid 19 on Supply Chain

Items	Mean	VI
Difficulty accessing material, goods, and services locally.	3.02	MI
Difficulty accessing materials, goods, and services internationally.	2.71	MI
Difficulty exporting goods and services.	2.85	MI
Difficulty importing goods from abroad.	2.59	MI
Lower domestic sales to consumers	2.84	MI
Lower domestic sales to business	2.84	MI
Overall Mean	2.81	MI

Legend:

Highly Implemented (HI) 3.26-4.00

Moderately Implemented (MI) 2.51-3.25

Slightly Implemented (SI) 1.76-2.50

Not Implemented (NI) 1.00-1.75

Supply chains have significantly been affected by the pandemic. As mentioned in Table 1, supply chains ranked third in business operations significantly affected by this pandemic. This is because of the country-imposed lockdowns and checkpoints on every provincial and municipal border. The overall mean of the impact of Covid 19 to supply chains is $x=2.81$ with a verbal interpretation of Moderate Impact.

The main impact of the pandemic on the supply chain of businesses in Ilocos Norte is difficulty accessing materials, goods, and services locally ($x=3.02$). Many merchants and businesses have a hard time getting supplies from local suppliers because of the strict compliance of Ilocos Norte with the protocols and lockdowns imposed by the provincial government. When interviewed, local executives (mayors of the municipalities) have been closely monitoring the spread of the virus because only a limited number of hospitals can accommodate those infected. The province cannot

Impacts of Covid-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

go into a risk level of infection. Thus, all the municipalities in the province barricaded their entrance and exit points making it difficult to transport goods and services.

Another pandemic effect on the supply chain is that enterprises have difficulty exporting goods. This means that businesses, especially those local manufacturers, have problems exporting their manufactured goods because the demand for their products is decreased and disrupted. Lastly, sales for both consumers and businesses ($x=2.84$) have decreased. Because of lockdowns consumption rate of people decreased. That is why there is a lowered to no sales of businesses, prompting some of them to close down temporarily or permanently.

Mitigating Measures that Companies Implemented

Table 4. Mitigating Measures

Statements	F	%
Introduces alternative products	141	40.1
Offering lowered prices	160	45.5
Adjusting marketing strategies	177	50.3
Upskilling staff	79	22.4
Emergency response teams	38	10.8
New health and safety protocols	214	60.8
Customer experience improvement	127	36.1
Canceled planned upgrades, expansions, or improvement	59	16.8
Sourcing from new suppliers	91	25.9
Online Sales	201	57.1
Remote Work	23	6.5
Investing in upgrades, renovations, or business improvements	64	18.2
Significant downscaling	25	7.1
Temporary closure	77	21.9
Permanent closure	13	3.7
Changes in packaging	65	18.5

Table 4 summarizes the mitigating measures that companies implemented when the pandemic affected the province of Ilocos Norte. 60% of the companies were obliged to follow health and safety protocols. Face masks, face shields, social distancing, and avoidance of crowded places were among the health protocols businesses implemented. Minors were also not allowed to enter establishments. Moreover, 57% (201) made their digital transformation by making sales online. For business establishments to maintain or increase sales, many establishments in Ilocos Norte shifted their operations digitally. Half of the establishments said that they implemented new marketing strategies. Many businesses have partnered with third-party logistics (TPLs) like Snap Delivery, TikTok, Umayen, and Food Panda. TPLs made a significant contribution to the increase in sales of establishments. Because of the strict implementation of lockdowns and safety concerns, residents opted for these TPLs to deliver necessities such as food and groceries. Also, another new marketing strategy that many businesses use is social media platforms such as Instagram and TikTok to increase their presence and therefore increase their customers and sales. Other

Impacts of Covid-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

mitigating measures implemented are offering lowered products and introducing alternative products.

One glaring finding is that only 6% of the respondent establishments resorted to working remotely. In Ilocos Norte, most of the businesses are micro and small enterprises which means that they are mostly family businesses like sari-sari stores and small manufacturing businesses.

Significant Difference between Micro, Small, Medium, and Large Enterprises

Table 5. Results of analysis of variance (ANOVA)

	Sum of Squares	df	Mean Squares	F	p-value
Size of Business	4.79	3	1.597	2.63	0.04
Residuals	211.71	348	0.608		

Table 5 shows the significant difference between micro, small, medium, and large enterprises on the supply chain impacts. The p-value is 0.04, which means that it is statistically significant. The responses of the different businesses are significantly different. This means that the impact of the pandemic differs on the size of the business. For example, it is observed that most of those who temporarily or permanently closed are micro and small businesses. Micro and small enterprises have limited resources compared to medium and large businesses. They have limitations in implementing new strategies because they do not have sufficient funds. Micro and small businesses also have limited production because they have difficulty accessing raw materials, as stated in the previous findings. Unlike medium and large businesses with warehouses to hold a large number of inventories, micro and small businesses operate daily.

CONCLUSION

The findings shed considerable light on the alignment of the micro, small, middle, and big firms with current worldwide trends on COVID-19. The statistics demonstrate a high degree of correspondence with most COVID-19 answer categories as derived from the worldwide literature. Generally, businesses have responded by following global literary trends in most fields. First, and most importantly, on the issue of COVID-19's impact on businesses, the analysis indicates that a significant number of businesses have experienced sales declines and shifts in operating hours, with most businesses predicting some future impact of COVID-19, which is consistent with the literature.

This has led to the conclusion that supply chains are extremely susceptible to situations such as lockouts, labor shortages, and interruptions in the operations and relationships of suppliers and logistics companies. There might be major effects on sustainability objectives, especially environmental and social sustainability objectives. Therefore, our assessment of the research strongly argues that enterprises should engage in establishing more robust supply chains that can handle pandemic risks rather than disregarding pandemic risks or believing a pandemic would have a geographically restricted impact. Taking the danger of potential future pandemics seriously in supply chain planning is likely an apparent realization at this time, given the COVID-19 pandemic.

Impacts of Covid-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

Businesses must manage their finances to exist and qualify for government subsidies and other government incentives. COVID-19 has a significant effect on operations, primarily supply chain management. Numerous organizations are pursuing local sourcing because of supply chain disruptions. Centrally controlled, digital supply chain networks have become a new worldwide goal, and businesses have agreed to prioritize digital supply chain expertise. According to solid evidence in the literature, enterprises prioritize changes to marketing strategies/digital marketing, staff upskilling, and health and safety standards as the top three resource-based mitigations. Enterprises pursue technology as a solution by establishing a connection between the two. With regards to operations, critical resources and mitigating strategies include social isolation, communication, and facility reconfiguration. This is in addition to the obligatory health and safety training.

The pandemic's impact on the supply chain differs depending on the size of the enterprise (micro, small, medium, and large enterprises). For instance, many micro and small enterprises temporarily or permanently close because of the difficulty of accessing raw materials. They do not have big warehouses, unlike the medium and large enterprises.

As the effect of COVID-19 spreads throughout the Philippine economy, businesses operating in Ilocos Norte are hit. Manufacturers of completed goods that are typically spread across the value chain cannot acquire raw materials locally. COVID-19 triggered a local lockdown, affecting wholesale, retail, and distribution businesses. As a result, COVID-19 has affected the supply chain sector, resulting in increased inflation and decreased number of items dispersed across the value chain.

LIMITATIONS AND FUTURE RESEARCH

With COVID-19 having a significant influence on the supply chain, essential measures are required to offset these consequences. First, the supply chain must be connected to guarantee that commodities are delivered seamlessly from manufacturers to consumers. Additionally, technology adoption in supply chain procedures is critical to the supply chain industry's sustainability. Finally, at the moment, upskilling supply chain actors is vital. The individuals engaged must be technologically savvy and equipped for technological adoption to help in risk absorption in the supply chain business. The creative approaches include the use of technology to accept consumer orders, strategic collaborations between manufacturers, middlemen, and delivery businesses, and innovative inventory management to minimize stock-outs. The majority of these strategies have been demonstrated to be successful and should be maintained in the future.

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Impacts of Covid-19 on Supply Chain and Business Operations on Enterprises in the Province of Ilocos Norte

Eric S. Parilla, DBA, FBE, Marc Edward Abadilla, MBA, AFBE

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