Designing a System Dynamics Model for Cash Flow in Omni-channel Retailing System

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Abstract

Every firm must adjust to the needs of online trade to manage many consumers' contact channels and using an Omnichannel is one such approach. The current study examines an omnichannel system, implementing three different scenarios and developing a system dynamics model. Simultaneously, the effects on cash flow, inventory, delivery time, and distribution costs are evaluated. As a result, the stock-flow curves and the causal model were created. The resulting concept was then tested and put into practice. In order to maximize the usage of the omnichannel system and expand the retailing capacity, three scenarios were created and put through simulation. Finally, the performance of the suggested model was evaluated by merging the first and second situations. According to the findings, a company's inventory is at its lowest point, and its cash flow is at its best when using the omnichannel system alone. The second scenario alone was not implemented since it did not result in what was desired. The third scenario provides the largest cash flow and delivery time values, according to a comparison of the results of the other scenarios. The first scenario is preferable if the company decides to lower the distribution costs at the cash flow expense.

Keywords: Cash Flow, Omnichannel, Retailing, Online Sales, System Dynamics

1. Introduction

Sales refer to transactions in which multiple channels engage in trading a single product. Business models must constantly update to compete with competitors in the current complex world and create a desirable value [1,2]. This trend will enrich e-commerce in the next few years [3]. Besides, several integrated sales channels allow customers to place their order and receive the ordered product in the best way that suits them [4,5]. Omnichannel retailing has changed the dynamics of the Supply Chain (SC). Therefore, every node in the SC represents an executive center [6]. Cash flow is a vital issue in SC and omnichannel retailing [7,8]. First, they are important in terms of cost and investment. Second, costs and investments increase as one makes progress in the SC. Thus, optimizing the total SC costs directly (often very significantly) contributes to the overall chain's profitability [9,10]. There are three main flows involved in Supply Chain Management (SCM): product flow, information flow, and financial flow. Cash flow includes credit terms, payment schedules, and shipment ownership arrangements. Procurement management and SCM literature often discuss issues related to product and information flows.

The increasing growth of distribution companies, competition, overhead costs, and systemic or process problems have led distribution systems to improve internal processes [11]. Given the importance and necessity of managing the physical distribution, the importance of which is placed next to other marketing mix elements. The producer and company's life depend on the distribution of its products [12]. The more successful a company is in distribution, the more successful it is in its other strategies. Meanwhile, as a new method in the field of distribution, Omni-channel can be very efficient and useful in some industries and production branches, and this approach cannot be avoided [13]. Because customers' thinking towards increasing welfare and despite many competitors, more and more attention to customers and customer popularity is undeniable. Omni-channel is a wholesale and retail strategy in which the user experience is integrated through online review via mobile and other items. An Omni-channel distribution network will be complete and work at its peak if a dynamic financial flow is formed and comes to life alongside a system [14]. It is because an Omni-channel distribution system has to have an active and dynamic mechanism like an alive creature. In the Omni-channel, the customer is the center of attention, regardless of the communication channel [15].

This issue means that the customer journey should not be repeated or reversed but should always move forward. The customer's response must be given instantly, i.e., customers' purchase history must be entirely stored in the system [15]. Each interaction with the user should take the customer one step further. For example, if the customer is chatting with the support manager, the customer should be able to continue the conversation via SMS or follow the work process over the phone. Finally, a tracking code or any other document will be sent to the customer via email [16,17]. This method does not matter if the customer asks a question via email or needs support. Any communication request from the user should be made by reviewing the customer's history. As a result, using this method requires fundamental changes in how the organization operates and serves them [18]. Due to these cases, over time, the cost of all factors affecting customers' purchases will be recorded so that the retail system can follow changes in opinions and changes in selling products' financial processes. Accordingly, system dynamics is an approach to understanding the nonlinear behavior of complex systems over time using feedback loops [19]. The basis of the idea is dynamic systems. Scientists in the field of system dynamics believe that the evolution of any system is lawful and can be recognized and thus steer the path of evolution in the desired direction. The system dynamics approach aims to provide the analyst with the tools to discover these underlying rules [20]. The system's dynamics methodology not only claims to know the laws governing the universe's evolution but also makes it possible to construct a model of real phenomena using simulation tools [21]. To a large extent, the simulated system has the characteristics of a phenomenon in the real world. System dynamics is a coherent dynamic approach to modeling that combines quantitative or qualitative aspects to simulate a phenomenon over time. Using causal and flow-state diagrams makes systems dynamic more appropriate than other methods for studying complex systems [22].

A review of the literature shows there are numerous studies on SC finance. For instance, [23,24] reviewed the existing literature based on three themes; Concepts and definitions of expected benefits and SC finance initiatives. Xu et al. [24] conducted a bibliographic analysis of the existing finance literature. They provided bibliometric information on articles published on the Financial Supply Chain (FSC) and identified four existing financing chain research clusters. Distribution systems are also an important part of the SC. Finance in distribution systems can make a business more efficient in terms of operations, improve financial productivity, and ultimately pave the way for system survival. The financial part of a distribution system is the driver of sustainable cost reduction and profitable growth through maturity planning models. Following these arguments, the survival of distribution systems in the current competitive market conditions can be guaranteed by improving financial productivity and accelerating digital and online trade/commerce. Accordingly, this study aimed to develop a system dynamics model for financial flows in the omnichannel distribution network to find out whether this distribution system is financially feasible or not.

The rest of this paper is structured as follows: Section 2 provides a review of the literature and discusses the variables affecting the research model. Section 3 describes the research methodology and the dynamic system. In Section 4, managerial implementation is presented. Finally, Section 5 concludes the paper.

2. Literature Review

SCM is an interdisciplinary management concept based on streamlining various flows that make up an SC [26]. There are many classifications of flows in the literature. They distinguish products, financial resources, human resources, information, knowledge, and technology as "trading elements" [27]. These differences are due to the flow of materials, products, and information in one direction and the reverse flow of information and financial resources [27,28]. These two studies consider products, services, information, financial resources, demand information, and forecasts as "SC flows". Given the range of activities performed in SCM, the logistics and marketing channels are usually considered channels of a company's interaction with its supply sources and sales markets [29]. A review of SCM's scientific contributions to financial flow optimization shows different procurement and finance approaches [24]. Some scholars consider net asset management as an important issue in SCM [30,31]. Beyond optimizing product flows by focusing on physical inventory reduction, some researchers have analyzed cash management tools. They have considered the optimal time of activities and control of receivables, debts, and advances as the main management tools. Besides, optimization and support of inventory and cash management have been addressed in the context of process management [32,33].

Stemmler and Seuring [34] were the first authors to use the term "SC finance". They highlighted the control and optimization of financial flows induced via logistics. The financial processes developed include inventory, financial flow, and support processes with immediate reference for procurement, such as stock insurance management. Another approach to optimizing cash flow in Supply Chains (SCs) is "logistics financing", which was defined by [35] (as "active marketing of financial services in addition to logistics services with logistics service providers". Logistics financing paves the way for logistics service providers to finance logistics structures [36]. The term Financial Chain Management (FCM), often used in the context of financial flow research, should be contrasted with the term "financial supply chain" [37]. The former is well-known in the SC literature and is defined as "financial flows within and between companies" [38]. Thus, the FCM should manage processes that are reduced to business processing steps [35]. FCM is set to optimize intercompany financial processes using collaborative and automated transactions between suppliers, customers, and financial and logistics providers. As a result, Information and Communication Technology (ICT) plays a decisive role in the collaborative process, affecting information or documents [39]. However, according to [40], accounting was taken seriously in SC research until 2020.

On the other hand, suppliers, partners, businesses, and vendors operating in SCs use the information and share it with others [41,42]. These associations lead to many challenges and opportunities in SCs [28]. Omnichannel is an intelligent, value-driven, and efficient process for generating new forms of revenue and business value for organizations and applying new approaches and technological and analytical methods [43,44]. This technique has been addressed frequently in previous studies. They have mainly focused on online trading channels [45–47]. There are also many studies in the field of finance dealing with pricing [48–51].

Creating an efficient SC is critical for optimizing all resources in a highly competitive and rapidly changing business environment. Early studies in SCs focused on product, service, and information flow alignment, disregarding the financial aspects. Accordingly, the current research line focuses on the importance of financial flows and other components of the SC. The interest in FSC increased after the financial crisis in which bank loans declined significantly. This issue highlighted the need for better management and optimization of working capital.

Furthermore, another issue of interest is focusing on the omnichannel strategy's financial impact on SCM in terms of inventory, process, and cash management or through synchronization and collaboration. These variables affect the free cash flow of any company involved in increasing sales or reducing costs, as well as the cost of capital induced by reduced assets. However, less attention has been paid to the impact of omnichannel measures on the cost of capital. SCM's financial aspect is another issue of interest that requires more serious attention regarding methods and applications. Accordingly, the present study explores how employing omnichannel solutions can increase sales and cash flows and simultaneously reduce delivery time and distribution costs. One of this study's contributions is to shed light on omnichannel techniques and their impact on cash flows and financial processes. Furthermore, this study explores the relationship between delivery time, distribution and sales costs, and SC cash flow using omnichannel techniques. The contributions of this study are as follows:

- This research concentrates on financial flows' importance and some other SC parts.
- This study employs omnichannel to reduce distribution costs and delivery time and increase sales and cash flows concurrently.
- The present study demonstrates omnichannel and its impact on financial processes and cash flows.
- The current research uses omnichannel to investigate the relationship between distribution and sales costs, delivery time, and SC cash flow.

3. Methodology

This section describes the research design, the procedure, and the instruments used to collect and analyze the data.

3.1 Research Design

The present study is an applied study. It employed a descriptive-qualitative method to develop an omnichannel model for the distribution network. The required data were collected from company X's (For security reasons, the company did not permit to disclose its name in this paper) financial department and SC database. System dynamics (the focus of this study) is a computer-based approach to policy analysis and design that applies to dynamic issues arising from complex social, managerial, economic, or ecological systems. In other words, it is a dynamic system characterized by interdependence, interaction, information feedback, and inverse causation [52]. The system dynamics approach employs interpretive features and quantitative techniques in the data collection process for modeling. The core aspects used in the modeling process are summarized in 5 stages: Problem statement, dynamic hypothesis, formulation, testing and validation, policy formulation, and evaluation. Given this study's practical nature, its findings can be used to improve indicators affecting the SC's financial sector using the omnichannel distribution system. Therefore, to improve strategies and move towards success, the present study develops a dynamic SC model using an omnichannel distribution system. To this end, the data of Company X are used for modeling. This study investigates the use of the system dynamics model. Fig. 1 shows the steps taken in this study:

Please Insert Fig. 1 about here.

In the first step, library data and expert opinions are used to identify the factors affecting cash flows in the omnichannel distribution network. In the second step, the relationship between the identified factors and the directions of their effects was explored. Upon confirming the model components, the collected data will be analyzed. The data analysis findings can be used to optimize all omnichannel system distribution networks and improve their resources.

3.2 Dynamic Hypothesis

Defining a dynamic hypothesis is vital in improving system dynamics modeling performance. A dynamic hypothesis is a theory about the existing structure that produces reference states. A dynamics hypothesis can be expressed verbally, as a causal pie chart, or as a flow chart. The dynamic hypotheses can be generated and used to determine the factors that are retained in the models and the excluded factors [53]. After surveying the experts and reviewing the literature, it was found that some factors were more effective. Besides, the factors with similar effects were excluded to simplify the model [54,55]. Due to the size of sales outlets in omnichannel distribution systems, cash flows and distribution cost adjustments are important. A thorough analysis of the system's variables is essential to examine the variables and how they influence and influence the whole system. Such an analysis can be performed by modeling the system dynamics. Accordingly, three main hypotheses are developed and tested in this study:

- **Hypothesis 1:** By developing a system dynamics model, it is possible to identify the optimal values of variables affecting cash flows in the omnichannel distribution system.
- **Hypothesis 2:** By developing a system dynamics model, the optimal values of the inventory, cash flows, delivery time, and distribution costs can be identified.
- **Hypothesis 3:** By designing a system dynamics model, it is possible to identify the effective path in cash flows in the omnichannel system distribution network.

3.3 Model Structure

3.3.1. Defining the model boundary

Each feedback system has a closed boundary at which the desired behavior is generated. The developer must clearly define the model boundary when developing a dynamic system model from the feedback system. It shows all components included in the final model. Table 1 shows the key variables used to model the research problem:

Please Insert Table 1 about here.

These variables have been collected through previous research and experts' opinions. The most important reason for their different use from other research is that one or more variables have been used in previous research. These variables have not been used simultaneously in any research to examine their effects. It can also be seen that the study of the effect of these variables on each other and on the objectives of the research as a whole has not been done in any previous research. Still, in this research using system dynamics, this has been evaluated. The data collection method is library studies, and the data collection method is the field. This study's statistical population is managers and supply chain and green supply chain specialists who were selected by the snowball method. They were interviewed openly, participated in the Delphi focus group and panel, and used them to fill decision matrices. The demographic characteristics of the statistical community of experts participating in this study are shown in Table 2.

Please Insert Table 2 about here.

Since this study's statistical population is a group of experts, we will not have a statistical sample. As mentioned, this study's statistical population includes 15 managers and green supply chain specialists who were selected for screening, selection criteria, and participation in other stages of the research.

3.3.2. Model Loops

The final layout of the model variables was determined after eliminating similar variables by the experts, as displayed in Table 1. Then, the relationships between the variables were determined based on whether they were input or output variables. These relationships are also shown via a causal model and the stock-flow curves. Finally, the resulting model was validated through the next step's tools.

The feedback loop's main idea is to identify boost loops in the system and balance loops that limit growth. This study employed a cause-and-effect technique and converted it into a stock-flow curve. The curve illustrates the relationships between the influencing factors. As stated earlier, the factors presented in Table 1 were examined to determine cause-and-effect relationships. Finally, the stock-flow curve was plotted. Fig. 2 shows two important loops in this curve:

Please Insert Fig. 2 about here.

Loop 1 is explained first. Huang et al. [56] suggested that the costs needed for scheduling the SC from different sources include materials purchase, production, inventory, and shipment. These factors increase inventory, cost, and scheduling time. Scheduling incurs substantial costs that put a further financial burden on the SC due to limited resources. Upon a rise in debts, non-cash-out rates increase, consequently increasing the cash flow by reducing the cash resources consumed. Curry [57] suggests that as cash flow increases, purchasing power increases, and inventory increases. As purchasing power increases, incoming units of the inventory increase, resulting in final inventory volume.

The first part of the second loop from the cash flow to the inventory is similar to the corresponding part in the first loop (details are in the paragraph above). With increasing the inventory in line with the demand rate, shipment costs rise due to a higher product delivery frequency to the customer. As this rate increases, the demand for goods increases, increasing sales. Consequently, as sales increase, the tax rate also increases following tax laws, and sales revenue decreases when the levied taxes increase. Since part of the revenue is in cash, as the sales revenue decreases, so do the cash sales volume. As these funds decrease, cash also decreases, and as a result, cash flow decreases.

3.3.3. Cause-and-effect relations and stock-flow curve

As stated earlier, the causal model in this study was developed by surveying the subject-matter experts, defining variables, excluding duplicate variables, and categorizing them into related categories. The developed model is shown in Fig. 3. The simulation period was considered 36 months. Finally, following the research model, the stock-flow curve was developed, as shown in Fig. 4.

A time horizon for the project needs to be determined to run this model. Choosing the right time horizon is crucial to analyzing the model results. Usually, the time horizons of causal loops are short-term horizons, while the effects of learning and feedback loops are long-term. Therefore, creating a balance between the time horizons of the causal learner and feedback loops has an important impact on the time horizon set for the model.

Please Insert Figs. 3 and 4 about here.

In most empirical studies conducted in finance and especially in cash flows in the SC, a 3-to-5-year return period was chosen to evaluate the results. Therefore, according to experts, a time horizon of 36 months, i.e., three years, was considered in the research model. There would be enough time for evaluating the performance of the feedback loop.

The two main loops in the model were described in the previous section. According to Lim et al. [58], consumer physical convenience (ease of access) affects consumer convenience in terms of access time, and these two factors, in turn, affect product availability. Furthermore, Tao et al. [59] showed that new, technologies such as shopping websites and applications, affect product availability. For example, online sales have led other customers to reach products directly without taking different routes. As a result, product availability increases in addition to consumer physical and time convenience.

Moreover, product availability through these methods reduces distribution costs and delivery time and increases shipping rates. Due to the use of technologies such as applications enhancing the convenience of placing orders in terms of physical and time convenience, the scale of active users of these applications increases significantly. Accordingly, this increase affects the percentage of online sales, sales through apps, and other sales techniques. The higher the rate of this type of sales, the lower the rate of other types of sales. As sales percentages increase, so makes total sales and similar sales revenue.

On the other hand, according to tax laws, the higher the sales, the higher the tax rate reducing the final sales revenues. It makes sense that as sales increase, so do cash sales and credit sales as components of total sales figures. As cash sales increase, so do sales rates, increasing short-term and long-term credit sales.

To meet the consumer demand, we need to transport and deliver goods to increase demand, the transportation amount, and consequently its rate increase. This increase indicates an increase in sales. Furthermore, the order rate increases as demand increase because demand makes sense through an order. On the other hand, as demand increases, the ability to meet consumer demand decreases. Then to overcome this issue, the retailing capacity can be increased. Meeting consumer demands is influenced by another factor, i.e., the delivery time. The shorter the delivery time, the more demand can be covered over a specific period. Besides, as the delivery time is affected by the order rate, the higher the order rates, the higher the delivery volume, increasing the delivery time. Overall, it can be argued:

- By creating the omnichannel distribution system's infrastructure and moving towards online sales and app sales, the distribution cost is reduced due to easy access to goods.
- The higher product availability, the shorter the delivery time due to extensive coverage and a shorter distance.
- The inventory decreases over time due to a decrease in sales, while sales increase due to product availability and ease of purchase.
- Cash flows increase due to reduced credit sales as a result of decreasing the ability for credit sales through the internet and apps and increasing cash sales.
- Cash flow increases as distribution costs decrease and sales increase due to higher product availability.

Using the model developed via Vensim software, the relationships between the research variables and the type of incremental or declining relationships as well as feedback loops, are determined. Cash flows representing the most important variable in the research model were estimated using the following equation:

Cash Flow = (Cash Flow*Cash in Rate) - (Cash Flow*Cash Out Rate)

3.4. Model Validation

3.4.1. Boundary adequacy test

This test examines whether there are any influencing factors in the model or not. As stated earlier, the factors addressed in this study were determined by reviewing previous studies and surveying experts in the field. Therefore, both previous studies and experts confirmed the significance of these factors. In the next step, the system behavior was evaluated by eliminating the factor in question to determine each factor's necessity. The model outputs after removing each of these factors are shown below.

Fig. 5 shows the effect of removing the "Credit Sales" factor on the "Cash Flow" as a state variable. In this case, as credit sales increase, cash flow decreases due to the lack of cash flow into the financial cycle. The direct effect of this type of sale on the cash flow rate is shown in the figure. As seen (in Fig. 5), the cash flow rate is lower if this variable is present in the model (the red curve). When this variable is removed (the blue curve), there is an increase in the cash flow rate, implying that if sales move more towards credit sales, the cash flow rate will decrease.

Fig. 6 shows the effect of removing the "Improvement of service quality" as another factor in the model. Assuming other factors are constant, inventory volume does not decrease in the long run because sales and demand decrease to reduce service quality. The blue curve in Fig. 6 shows when the "Improvement of service quality" is removed from the model. Fig. 7 shows the effect of eliminating the "Demand" (the blue curve) as another factor in the research model. Under this scenario, the delivery time is reduced. This figure shows that the lower the demand, the lower the delivery rate and the delivery time because the quantity of goods delivered is lower. Fig. 8 shows the effect of removing the "Shipment Rate" on the distribution cost. Under this scenario, transportation imposes a high cost on the cash flow and covers many of the SC's financial resources. The figure shows that distribution costs increase when the model's shipment rate (the red curve) is present. In contrast, distribution costs decrease when this factor is removed (the blue curve).

Please Insert Figs. 5-8 about here.

As this study has focused on financial issues, variables such as inventory have been assessed in dollars to show the inventory's financial value.

3.4.2. Boundary testing

Boundary testing assesses the model's behavior when the model inputs are in the boundary conditions, i.e., between extreme ends of the input values. This test shows whether the model is stable under boundary conditions or not. In the boundary adequacy test, the boundaries of the variables in the infinite state (the maximum value) are examined in two states:

a) Sales in cash are at the highest level (Fig. 9): If the cash sales have the highest share than other sale types, the cash inflows' rate increases. Accordingly, the cash flow rate increases.
b) The product availability is at the highest level (Fig. 10): When the product availability increases shipping, costs decrease as minimum transportation is required to deliver the goods to the customer. Furthermore, since shipping costs constitute a significant part of distribution costs, distribution costs are reduced when shipment costs decline. Therefore, as shown in Fig. 9, when the product availability is at its highest possible level, the distribution cost (the blue curve) decreases.

Please Insert Figs. 9 and 10 about here.

3.4.3. Consistency error test

This test assesses the model outputs' sensitivity to the time interval selection. To this end, the 36-month time interval in the research model was changed to 60 months. As shown in Fig. 11, the model's behavior did not change when the period in question changed from 36 months and 60 months, and the factors affecting the performance, if controlled, can further improve the performance.

Please Insert Fig. 11 about here.

3.4.4. Behavior reproduction test

Does this model reproduce and simulate the system's behavior in real conditions? The answer to this question can be provided using the behavior reproduction test.

According to previous studies' extensive investigations, the present study addresses variables affecting inventory, delivery time, distribution cost, and cash flow to predict the system behavior after identifying the variables. As shown in Fig. 12, controlling the factors affecting the system's behavior can help increase the cash flow rate. However, other factors require more coordination time to achieve the SC's desired cash flow rate.

Please Insert Fig. 12 about here.

3.4.5. Scenario Making

The factors influencing the development of an SC utilizing the omnichannel distribution network in the SC of Company X were found after analyzing the results obtained for various variables and evaluating their impact on the primary variable in the relevant periods. The decision-maker can select from various situations incorporating useful aspects to construct successful tactics. Three scenarios were created and simulated for each state variable in this study. As illustrated in Fig. 13, the proposed scenarios were simulated for all significant factors.

Please Insert Fig. 13 about here.

- **Scenario 1:** This scenario explores what happens if the proportion of internet and app-based sales rise from 60% to 70%. The inventory and delivery costs are ideal, as shown in Fig. 13. In this case, the usage of online shopping platforms and applications results in an increase in cash flow at the expense of a decline in the rate of credit sales. Sales must rise by enhancing technology use, investing in the technology development industry, and expanding access to online shopping platforms and applications to boost the inventory rate.
- **Scenario 2:** This scenario investigates whether or not increasing retailing capacity may benefit the SC and variables associated with the desired condition. The retailing capacity is estimated to expand by 10% for this purpose. According to the findings in Fig. 13, inventory and distribution costs are at their maximum levels in

this case. The cash flow and delivery time are fairly similar to their equivalent figures in Scenario 1.

- **Scenario 3:** The first two scenarios are simultaneously simulated in the third. The difference is that the first scenario is raised by 65%, and the second is increased by 25% due to SC's higher cost. As a result, online and app-based sales will rise from 60% to 65%, and the retailing capacity will increase by 50%. Applying these improvements, as shown in Fig. 13, reveals that the inventory rate and distribution cost are taking a position between the two earlier scenarios. Even so, the cash flow and delivery time are more advantageous.

The initial scenario varies according to the model's developments based on the current study's results. The cash flow is ranked after the inventory rate, distribution costs, and delivery times. This problem suggests that the optimal course of action may not always be to maximize the utilization of an omnichannel distribution system. Additionally, it was demonstrated that the efficient usage of such a system has a favorable impact on the key factors, namely delivery time and cost. Optimizing the omnichannel distribution system alone, as seen in Fig. 13, is not the ideal option for raising cash flows. In the second scenario, increasing retailing capacity shortens delivery times even more than in the first, but at the expense of significantly raising distribution costs and inventory levels.

Additionally, the cash flow rises to a level equivalent to the first scenario. This topic shows that, even with increased retailing capability, it is still hard to create a good environment if additional tactics are not used. Scenario 3 produces the results for both cash flow and delivery time (as illustrated in Fig. 13). The optimal position in terms of the SCs cash flow can therefore be achieved by combining these two strategies (maximizing the utilization of the omnichannel distribution system and growing the retailing capacity). It should be mentioned that the diagrams compare the outcomes of the events before and after the simulation.

4. Managerial Implications

While events such as the COVID-19 pandemic have had a profound effect on face-to-face shopping in the market, there is an urgent need to promote online shopping and sales through apps and assess their impacts on the economic situation of businesses. Therefore, businesses need to review their SC scheduling step by step to determine potential risks of failure and make necessary changes in their operations to prevent such a failure. Following this study's results, the best decision to maximize the cash flow and minimize the delivery time is to implement two strategies simultaneously: To optimize the omnichannel distribution system and increase the retailing capacity. Accordingly, businesses should improve the use of omnichannel distribution systems to prevent their SC's failure. Furthermore, if businesses seek to maintain their cash flow at the desirable position (and not in the best position) and minimize the distribution cost and inventory rate, optimizing the use of the omnichannel distribution system by 10% alone can be a better option. Therefore, to maintain their cash flow at the desired position and prevent the failure of the distribution system, businesses can comply with the following suggestions:

- Increasing online sales and sales through apps by 10% if the business's goal is to minimize distribution costs and optimize the cash flows.
- Increasing online sales and sales through apps by 5%, along with a 5% increase in retailing capacity if the business's goal is to maximize cash flows.

5. Conclusion

The dynamic nature of modern distribution systems has led to many financial uncertainties. Using an omnichannel distribution system seems necessary. It is due to the current market situation, events such as the Coronavirus (COVID-19), changing customer behavior, increasing interest in online shopping, product access through online systems, and comparing different vendors. However, it is interesting to explore the impact of implementing these systems on the SC's financial position, which was the present study's focus. For this purpose, a system dynamics model was developed to determine the variables affecting cash flow, distribution cost, delivery time, and inventory. After reviewing previous studies in the literature, identifying the research gap, and determining the influential factors, the causal relationships among these variables were determined and displayed in the stock-flow curves. Comparing the results of the different scenarios showed that Scenario 3 guarantees the highest cash flow and delivery time values. Therefore, to obtain the highest values for cash flow and delivery time, the best decision is to implement the two strategies of optimizing the omnichannel distribution system's use and simultaneously increasing retailing capacity. However, this case's distribution cost will be higher than Scenario 1. Accordingly, a comparison of the strategies defined for plans indicated that if the business goal is to increase the cash flow and reduce the delivery time alone, it must adopt the two strategies together. However, if the business wants to minimize the distribution cost but sees fit to reduce cash flow, the first scenario is a better option.

Given the world's current situation and the problems caused by the coronavirus disease (COVID-19) outbreak, this study's insights can be used to develop efficient models and determine the optimal situation in choosing between these scenarios following organizational policies. For this purpose, an attempt should be made to determine organizational policies and then review and select the most effective model to estimate each scenario's optimal values. Based on the findings of the present study, the following suggestions are provided to be taken into account in future studies:

- Developing and prioritizing the plans required to achieve the SC's optimal position: Future studies can design techniques for assessing each sales system's impact through the omnichannel distribution system. Therefore, by carefully evaluating these systems, potential risks can be reduced in critical moments (such as the COVID-19 outbreak). Besides, cash flows can be maximized, and the distribution cost minimized.
- Future studies can also investigate the impact of different investment types on priorities and how to implement them.

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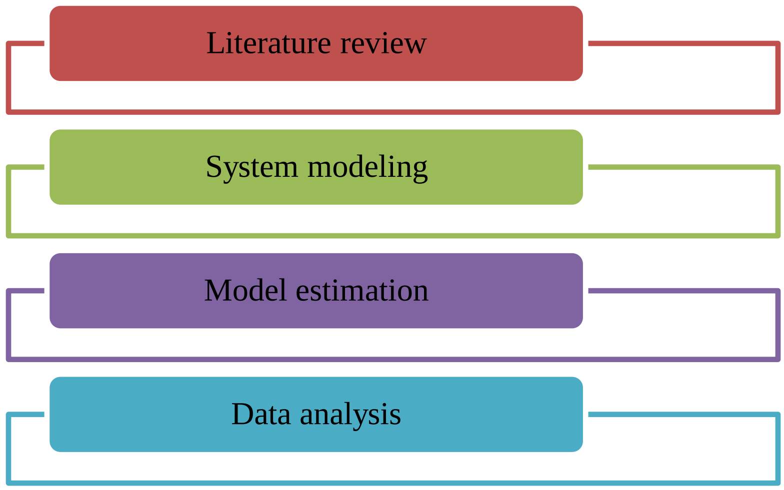
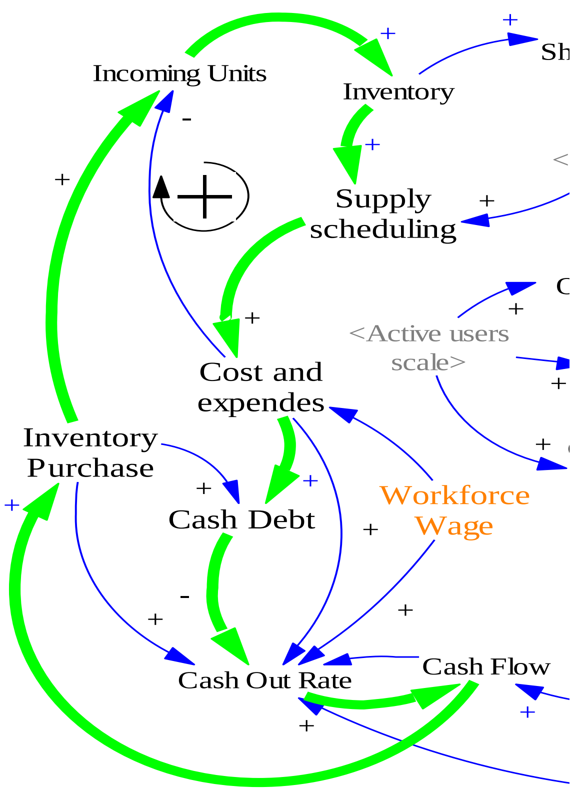
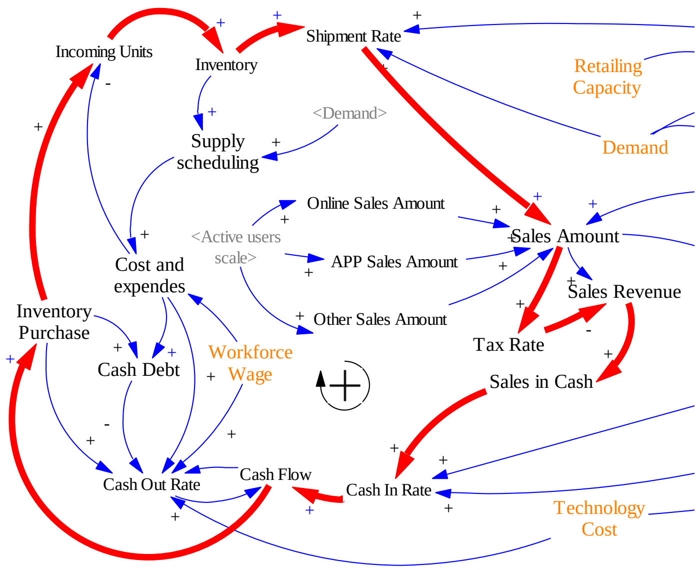


Fig. 1: The steps taken in this study



Loop 1



Loop 2

Fig. 2: Important loops in the model

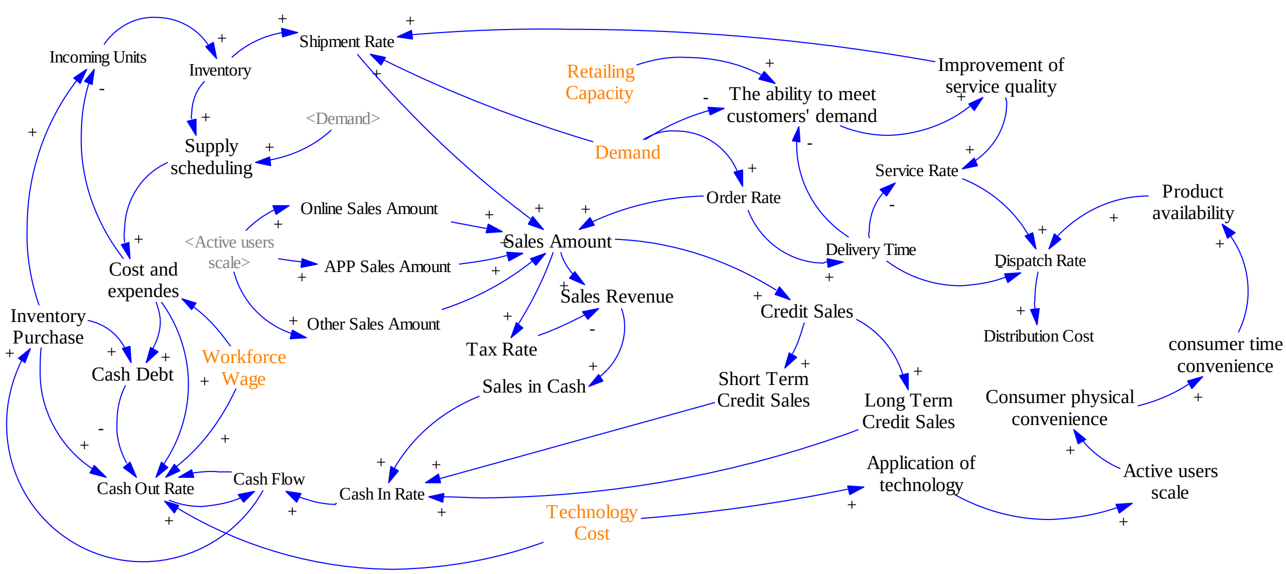


Fig.3: The Causal Model

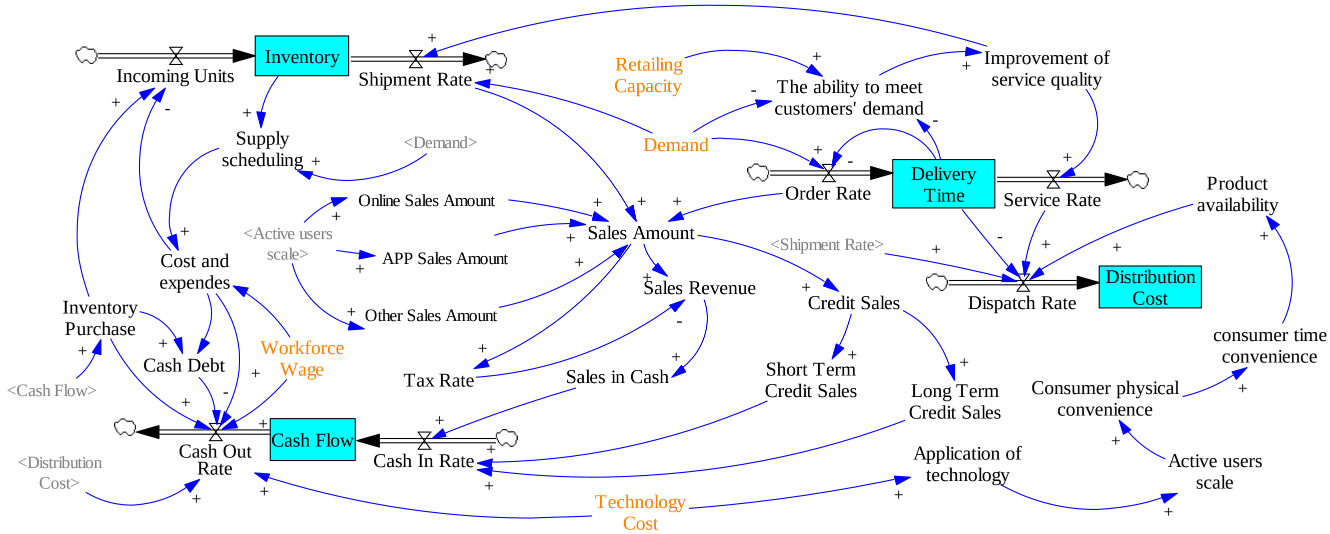


Fig. 4: The Stock-Flow Model

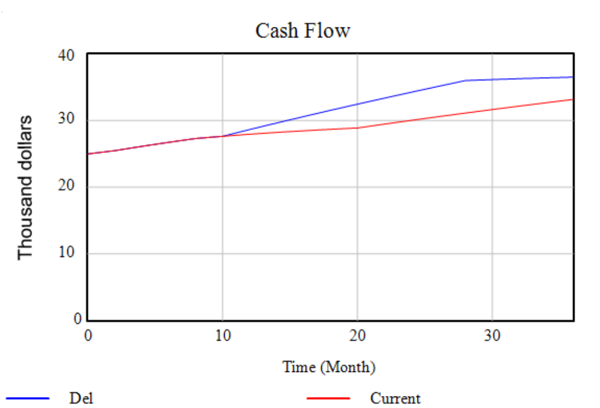


Fig. 5. The effect of removing credit sales

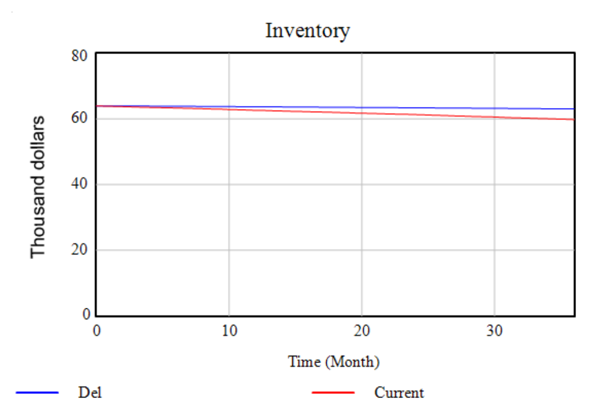


Fig. 6. The effect of removing the improvement of service quality

Fig. 7. The effect of removing the demand

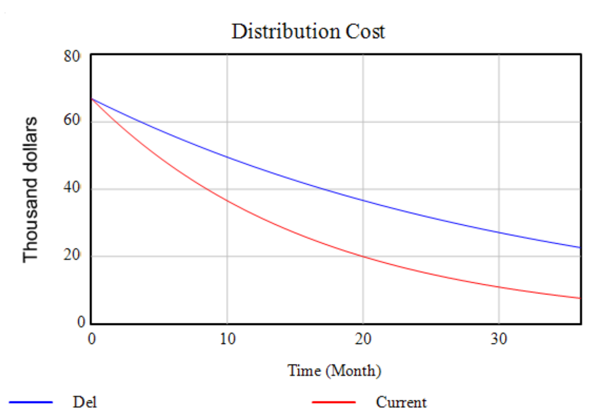


Fig. 8. The effect of removing the shipment rate

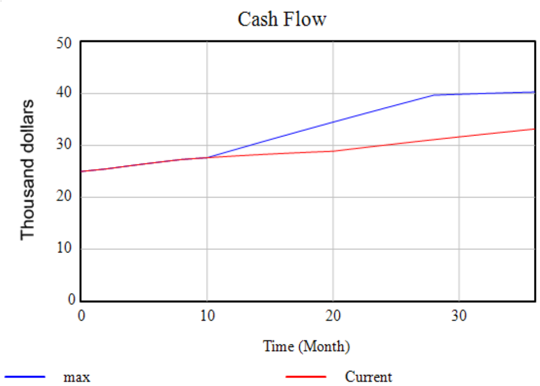


Fig. 9. Sales in cash under the boundary conditions

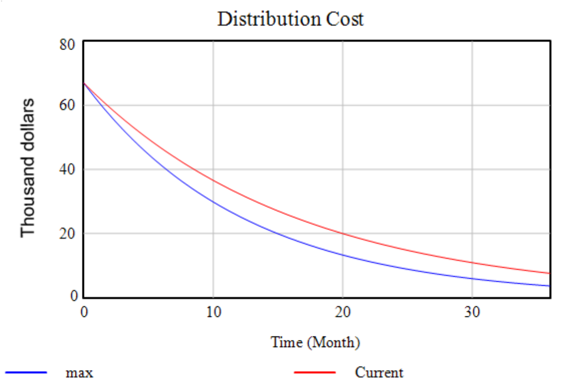


Fig. 10. Product availability under the boundary conditions

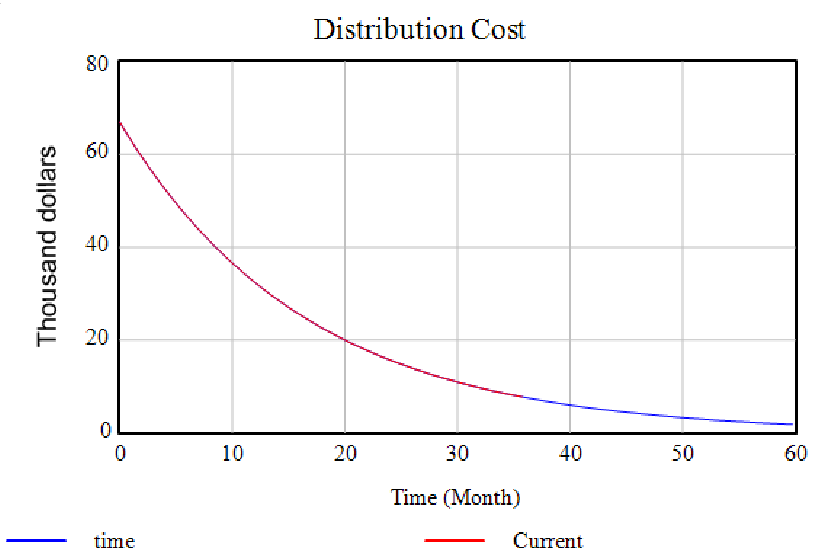


Fig. 11: The model outputs over 36 and 60 months

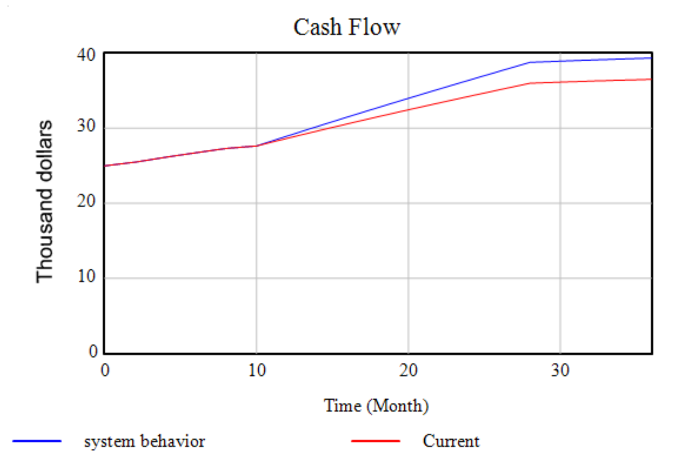


Fig. 12. The system behavior

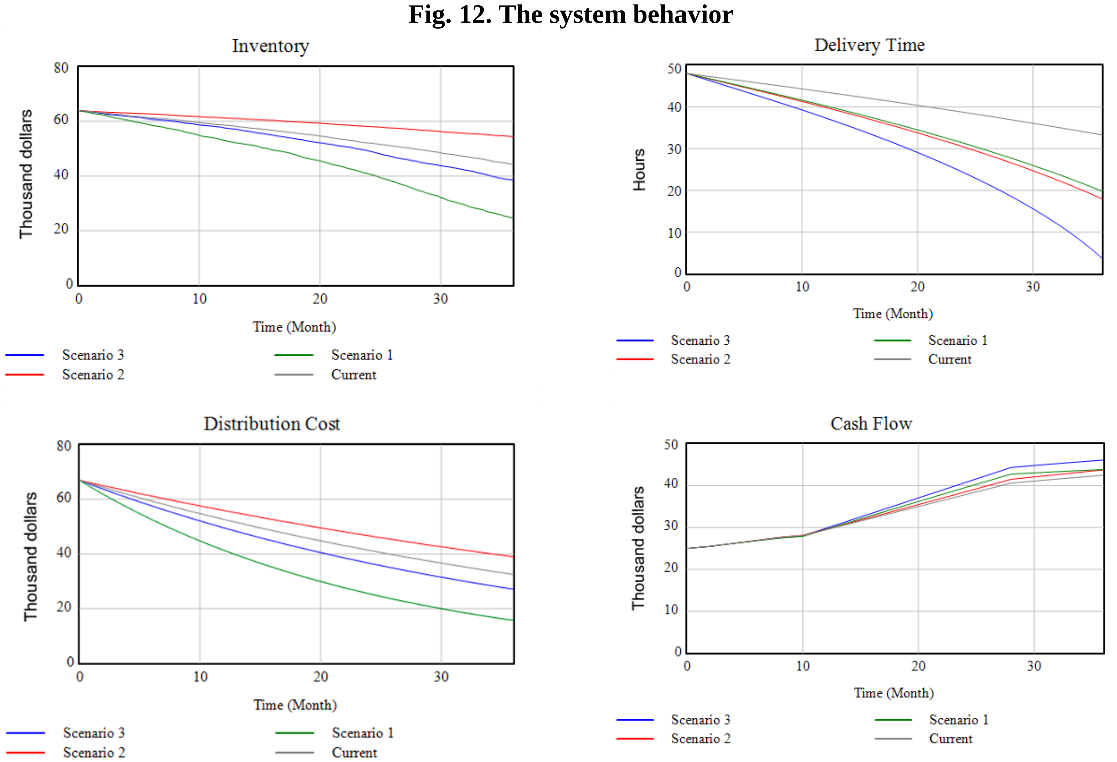


Fig. 13. The scenarios simulated in this study

Table 1: The key variables affecting cash flows in the omnichannel system network model

Row	Indicator	Type of variable	References
1	Incoming Units	Endogenous	[26]
2	Inventory	Endogenous	[27]
3	Shipment Rate	Endogenous	[31]
4	Supply scheduling	Endogenous	[34]
5	Online Sales Amount	Endogenous	[4]
6	APP Sales Amount	Endogenous	[60]

Row	Indicator	Type of variable	References
7	Other Sales Amount	Endogenous	[10]
8	Demand	Exogenous	[28]
9	Cost and expenses	Endogenous	[48,49]
10	Inventory Purchase	Endogenous	[48,49]
11	Cash Debit	Endogenous	[27]
12	Workforce Wage	Exogenous	[40]
13	Cash Out Rate	Endogenous	[36]
14	Cash Flow	Endogenous	[9,57]
15	Cash In Rate	Endogenous	[61]
16	Tax Rate	Endogenous	[32]
17	Technology Cost	Exogenous	[3]
18	Sales in Cash	Endogenous	[32]
19	Sales Revenue	Endogenous	[33]
20	Sales Amount	Endogenous	[29]
21	Retailing Capacity	Exogenous	[7]
22	The ability to meet customers' demand	Endogenous	[43]
23	Short Term Credit Sales	Endogenous	[34]
24	Credit Sales	Endogenous	[37]
25	Long Term Credit Sales	Endogenous	[25]
26	Application of technology	Endogenous	[50]
27	Consumer physical convenience	Endogenous	[1]
28	consumer time convenience	Endogenous	[4]
29	Distribution Cost	Endogenous	[45,46]
30	Dispatch Rate	Endogenous	[36]
31	Product availability	Endogenous	[30]
32	Service Rate	Endogenous	[45]
33	Delivery Time	Endogenous	[35]
34	Order Rate	Endogenous	[28]
35	Improvement of service quality	Endogenous	[39]
36	Active users scale	Endogenous	[38]

Table 2: Demographic profile of research experts

Age				Experiences		Education			Gender	
30-40	**41-50**	**51-60**	**Above 61**	**Between 10-20**	**Above 21**	**BS**	**MS**	**PhD**	**M**	**F**
2	4	6	3	4	11	5	7	3	15	0
13.3%	26.7%	40%	20%	26.7%	73.3%	33.3%	46.6%	20%	100%	0%