Proceedings of ICFTBA 2024 Workshop: Finance's Role in the Just Transition
DOI: 10.54254/2754-1169/144/2024.GA18978

Research on the Influence of Technological Innovation on Logistics Enterprises

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Abstract: Logistics is an important part of the national economic system, which plays the function of promoting the circulation of goods between regions and maintaining market balance. In recent years, the rapid development of technological innovation, the complexity of market supply, and the increase of cost (such as vehicle safety and cargo damage) have brought huge impacts and fluctuations to traditional logistics companies that take integration and coordination as their business, and it is urgent to sort out and summarize from the theoretical aspects. Taking a logistics company in Shanghai as an example, this paper summarizes and analyzes the impact of technological innovation (such as new models such as flying wing trailers) on logistics enterprises, discussing and illustrating the role of load factor on the logistics industry. It aims to explore a feasible solution for related enterprises, establish a competitive advantage, seize the opportunity for future development and occupy more market shares.

Keywords: Supply Chain, Traditional logistics, Load factor.

1. Introduction

Logistics costs in Shanghai's traditional logistics industry are becoming rising, which is a great threat for its development sustainability and competitiveness. However, given the urban logistics landscape is rapidly changing, these companies are finding themselves strapped by high costs associated with fleet management, fuel consumption and regulatory compliance. Moreover, local policies that promote environmental sustainability and better urban mobility, add more challenges to this task. For instance, if Shanghai Environmental Protection Bureau’s emission standards are introduced, logistics companies have to offer newer, cleaner vehicles at their own costs. As a result, it often puts small businesses under huge financial pressures [1]. Although these policies are critical in advancing public health and preventing urban pollution, they also compel logistics companies to move almost overnight at great expense.

Moreover, the operation mode of the traditional logistics vehicles also aggravates these financial burdens. Yet many companies still base their vehicle operating models on outdated, inefficient and no longer adequate means to meet the demands of the contemporary logistics world. An analysis of existing literature on the issue demonstrated that inefficient route planning, under utilization of the cargo floor, and absence of real time data integration result in an increased fuel consumption and higher operating costs [2].

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Studying the high costs of the traditional logistics companies and their vehicle operating models is extremely important. To address these challenges is critical and to develop potential solutions that will potentially enhance efficiency and decrease costs. Further, analyzing the effect of local policies on these companies, will help understand how regulations can be formulated to foster rather than thwart their business. The study not only enriches the current academic discussion on logistics and supply chain management, but it also offers practical implications for policymakers and industry participants who wish to construct a more sustainable and efficient logistics system in Shanghai.

In summary, traditional logistics enterprises in Shanghai are confronted with the challenge of rising cost of operation and innovation in transport operation mode, and at present time comprehensive research of this field is more urgent. If researchers deal with these issues, Shanghai will have a logistics environment which is in line with economic growth and essential sustainable development goals.

2. Current Situation

In 2005, Shanghai Chenxu Logistics Co., Ltd was established to be part of the most influential road cargo transportation, warehousing, loading and unloading service provider in Shanghai-Quzhou area. Nevertheless, the company has been confronted with increasing difficulty on account of rising operating costs, dwindling profits, and numerous safety and management problems, over time. Looking at Table 1 for the past 3 years (2021-2023), these struggles can be seen as profits, while the company was trying to keep revenue up, margins shrunk continuously. In 2021, Shanghai Chenxu Logistics handled turnover of 4 million yuan, net profit of 390,000 yuan, and profit margin of 9.8%. In 2022 turnover rose slightly to 4.2 million yuan but profit growth stalled at 390,600 yuan and profit margins fell to 9.3 percent. In 2023, turnover fell to 3.9 million yuan, profit fell to 331,500 yuan, and the profit margin reduced to 8.5 percent. The trend here is downward, and this means that the company is suffering under rising operating costs and inefficiencies that hurt the company's financial health and its competitiveness. These financial difficulties are compounded by still persistent safety and operational issues that threaten both people and goods. Safety accident rate per vehicle increased from 3 percent in 2021 to 4 percent in both 2022 and 2023, showing signs of difficulty sustaining safe standards. Inadequate vehicle maintenance, poor safety management, and inadequate training for drivers and operators can lead to these accidents and notices that increase the probability of accidents and disruptions. Moreover, the cargo damage rate has plunged considerably year over year; 2022’s rate was 7 percent, compared to 6 percent in 2021 and 9 percent in 2023. The occurrence of these increase signifies that issues exist in cargo handling and security measures which are derived from such problems as untrained personnel, outdate equipment and suboptimal loading protocol. Both high cargo damage rates, and the associated customer dissatisfaction, coupled with claims, replacements and potential loss of business, all of this comes at a cost. To solve these urgent problems, Shanghai Chenxu Logistics needs a strategy transformation, focusing on the accurate analysis of data, optimized route planning and improved safety management.

By implementing a data driven decision process, companies can learn how to optimize load, better plan routes and more efficiently utilize resources. By determining which routes across delivery points minimize cost, enhanced data analytics help manage to track demand patterns, optimize vehicle utilization and reduce fuel consumption, thus helping slash operating costs. Furthermore, safety procedures need to be improved and wide – ranged improvements should be made to personnel training in order to minimize the number of accidents and improve safety of cargo and personnel. Vehicle damage rates and it also reduces safety incidents can be reduced with regular vehicle maintenance programs, in addition to safety training for drivers and operators. It will also mean updating equipment, adopting real time monitoring technology and cargo tracking systems and improving cargo protection and handling protecting better and less chance of damage during cargo

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transportation. Overall, Shanghai Chenxu Logistics has a series of difficult financial and operational tasks that are likely to threaten their long term survival in a fierce market.

Through the use of data driven strategies, improving routes, strengthening security protocols and increasing employee trainings companies can look at reversing the trend of reducing profitability, improving safety standards and decreasing costs of operations. By adopting such a comprehensive approach, financial stability can be restored, services quality get improved and Shanghai Chenxu Logistics will be able to compete effectively in the ever growing industry environment.

Table 1: Profit on operating turnover (safety issues and cargo damage).

	Turnover/million	Profit/million	Profit rate	Safety Problem/per car	Damage of Cargo/per car
2021	400	39	9.8%	3%	6%
2022	420	39.06	9.3%	4%	7%
2023	390	33.15	8.5%	4%	9%

3. Problem Analysis

3.1. Traditional Vehicle Mode

The transportation of goods, the process of the logistics system, is based on included planning and management, this is a crucial support for transport and logistics trucks[3]. At present, Shanghai Chenxu Logistics Co., Ltd. is using traditional logistics model, namely, "four after eight". This arrangement has four wheels on two axles for the front, steering wheel and two axles (Bridges) for the rear drive mechanism. With a standard cargo carrying capacity of 13 tons this model can be good at some things, but there are very real limits during transport. This limited carrying capacity implies sometimes these companies are required to deploy 2-3 vehicles from the market to meet the transportation and delivery requirements.

Because the research rely on multiple vehicles, logistics operations are made more complicated, costs are increased, and efficiency are reduced [4]. Fluctuations in the supply of vehicles on the market compound the problem, as the source of vehicles can become inconsistent over time. It’s hard because this is unstable.

Moreover, the logistics staff is confronting important challenges which focus on driver safety awareness and time management issues. There are many drivers with their weak safety practices and thus higher risk of accidents and deteriorations [5]. Poor time management and these problems are further exacerbated by inefficiencies, which result from endless traffic delays that can lead to missed deadlines and reductions.

3.2. Low Efficiency

Matching available vehicles and drivers to available goods often goes slow in businesses leading to poor customer service as goods pile up before delivery. Several key factors cause this to be a challenge. In the first place, the demand for vehicle resources shoots up when the market is well supplied. But the supply of these vehicles has not kept pace, and for that matter has too often not been there at all, resulting in serious shortages. This is because an abundance of products, including in Quzhou and Shanghai, are sitting in warehouses unable to be shipped to arrive in time to meet customer demand.

On the contrary, when the supply chain is slimmed down the demand for vehicle resources goes down. Then drivers often opt for zero load orders to boost their load capacity. For example, this approach can cause delays because the driver will have to deliver only what is necessary to a destination, thus making the delivery of corporate goods to Quzhou or Shanghai stations take longer.

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As always, these timing issues are further aggravated by the traditional logistics model. For example, a vehicle leaving from Quzhou station at 8 PM around usually requires five and a half hours to reach Shanghai Station. When they arrive, it will be an hour or so to unload the goods. Then it takes another hour to cover the cargo with tarp to prevent rain damage, and especially so for tall trucks. After loading and unloading is finished the vehicles will travel approximately five and a half hours back to Quzhou.

This means it can take anywhere from an initial 13 hour shipment to a final 13 hour distribution. The underlying inefficiency in the logistics chain underscores the pressing requirement for better coordination and resource management in order to accelerate as well as enhance the delivery speed and reliability.

3.3. Driver Compensation and Cargo Damage

Currently, the relationship between driver compensation and cargo damage is becoming very troublesome. In the contract model, in which drivers are paid strictly based on the number of trips, drivers have little incentive to be vigilant about the condition of goods they transport. However, this disconnect reduces drivers' awareness of the risk of damage because they do not pay the cost of damaged goods. So, the liability for cargo integrity is removed from the driver, and the entire operation is put at severe risk.

As a result, over time, the research have seen a considerable increase in reported cargo damage incidents – from 23 in 2021 to 40 in 2023. The presetting of this trend doesn't only damage the trust and satisfaction of consumers, but it also hurts the profits of transportation companies. Timely and complete delivery is critical to customers, and reports of damage continue to rise, putting at risk the reputation of the companies associated. Therefore, inevitably, the revolution and focusing on the personnel management take place, as active scientific and practical studies prove that the company's staff occupy one of the key places to ensure the effectiveness of the Company as a whole [6]. To achieve the goals of companies in the modern economy you have to 'glue' personnel for you to motivate, to stimulate, to encourage them [7].

4. Problem Solution

Enterprises need to buy and introduce it to a new model, the flying wing trailer model, had a length of 13.75 meters, able to carry 30 tons of standard cargo weight. A car is made up of a front body that has been assembled and disassembled voluntarily. Chenxu logistics companies can be benefited from the reduction of cost and improvement of time efficiency by using flying wing trailers. To achieve the improvement of operational efficiency and reduce the logistics cost, enterprises should take full advantage of flying wing trailer mode as far as possible.

4.1. Advantage of Vehicle Mode

The innovative trailer is 13.75 meters long and can carry anything of standard cargo up to about 30 tons making it a great leap forward in trailer technology. The design of which includes a unique feature of having an easy detachment of body along with a locomotive that can be detached and reassembled with ease. Indeed, this flexibility enables logistics companies to optimize their operations far beyond the extent this is ever possible with traditional trailers. Another of the flying wing trailer's outstanding features is its two electrically controlled sides, which it opens and closes at the press of a button[8]. In load and unload scenarios, this feature is very handy.

In contrast to standard trailers, which can only be accessed via a rear door, the flying wing configuration permits side access for stevedore loading and unloading. This dual access results in much improved efficiency, particularly in logistic environments which are busy and where time is

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critical. In today's fast market, customers generally have different delivery schedules and priorities. With conventional trailers, in the past, time sensitive cargo would have to be specifically placed in the back of trailer which complicated the loading process while also making the sensitive items more likely to be damaged.

For example, some sensitive goods need to be placed in the middle of the trailer to protect them from potential damages when in the rear. One of the main issues in this arrangement is that it's inaccurate with the delivery times, so the company can't know if they meet the customer's expectations on time. But flying wing trailers enable support crews to load and unload from both sides, which provides significantly increased operational flexibility. The feature is easy to understand and help prioritize and cargo loading management by ensuring necessary cargo are assigned to depart cargo with minimum effort that helps in ensuring overall satisfaction of customers. Additionally, because of growing customers' need for timely deliveries, the companies benefit from a clear competitive advantage delivered by flying wing trailers. Companies can respond quicker to customer needs, therefore maintaining high service standards and large market share by streamlining the loading and unloading process.

In turn, this improved ability to meet delivery expectations does not only foster customer loyalty, but also makes companies leaders in the logistics industry and extends their range in an increasingly competitive world. Secondly, the flying wing trailers have a particular construction that enhances operational efficiency. Logistics companies can buy two trailers and one locomotive, and one locomotive is located in Quzhou and the other locomotive in Shanghai so that it's strategically positioned.

The switchable tow body device allows for seamless switching between two bodies thereby greatly reducing downtime for loading and unloading operations. In Quzhou, drivers can drive off with a body full of goods, then quickly find again a body full of good with which to return from Shanghai. Simplified operation reduces the amount of time and energy spent loading and unloading this equipment. This is particularly impressive for the potential time savings. Older models traditionally need much more loading and unloading from different locations, which would add up to around 11 hours of transit time.

Whether this works at scale remains to be seen, but implementation of the flying wing trailer could save the company roughly two hours of load and unload time. It can arrive as early as 7:30 am in 30 am. The reduction in the time for a transit can greatly help to provide an overall good service to the customers while at the same time greatly helping the logistics companies to utilize their large operational capacity.

4.2. Advantage of Performance-based System

Companies are confronted with new challenges concerning their human resource management [9]. Therefore, the advanced salary system is indispensable. It is a revolutionary compensation structure, performance based salary system, designed to increase accountability and create a safety culture in the organization.One such mechanism, in fact, is a performance based salary system as opposed to a traditional seniority based system, and without this type of system it would be very hard to survive as a business in the face of ever harder competition [10]. Instead of blindly hiring drivers according to usual wage scale, the company is hiring drivers individually and binding their pay to specific key performance indicator, like vehicle maintenance, traffic violation and cargo damage.

Through this strategic shift the driver is asked to take on the role and understand that their earnings aren't driven only by their own actions. Profit sharing is at the core of this seemingly innovative compensation model. The 3.5% of company's gross profit for the month is equal to the driver's monthly salary. Due to the drivers direct link to the company's performance, it is in their best interests to drive safe and have a very well maintained vehicle. Drivers are more willing to take part in efforts

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to improve safety and lessen cargo risk when they see how each little thing they do impacts gross profit.

By using this profit sharing model, a static 'dead wage' model of compensation is changed to a dynamic incentive structure. Drivers feel like an extension of the company, working as part of the operations, understanding that they own it with the company. The mindset imbued with this mentality can also fuel them to work really hard and make the company successful. Therefore, drivers take action to prevent any defects from their vehicles and correct the disposal of their cargo.

5. Conclusion

The traditional structure of the operation of traditional logistics enterprises must be abandoned and cost is reduced with an increase of the load rate to increase the market competitiveness. In epoch of innovation change the companies, in the era of innovation change, with the companies in era of innovation change, should actively be innovative in adopting technological innovations such as flying wing trailers which are efficient transport vehicles t enable it transport load efficiency and save fuel and reduce carbon emissions. At the same time, reform of the compensation mechanism (share holding salary) and promotion of employee responsibility and enthusiasm further guarantees safety and decreases the attrition rate. The logistics industry in China is gradually following the enterprise management and technology theories in combination with the changing market requirements. Future research could therefore continue to explore the application effects of load rate optimization technologies and new modes of transportation, and how to combine a global point of view and local practices to facilitate local enterprises to achieve modern, data driven growth. This transformation will help its proceeding with a solid groundwork to enhance effectiveness, minimize costs also accomplish maintainable improvement.

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