

Leadership can reduce the impact of COVID-19 on the logistics system in the automotive industry

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ABSTRACT: The basis of this research paper is a literature research about the impact of the COVID-19 crisis on the logistics system in the automotive industry. The main purpose of the article is to find state of the art leadership methods to support the hypothesis: Leadership can reduce the impact of the COVID-19 pandemic on the logistics system. The result of this research support the hypothesis and clearly shows that the impact of the COVID-19 pandemic on the logistics system can be reduced by applying specific leadership methods and/or speed up the return of the logistics system back to the status of the pre-COVID-19 level.

Keywords: leadership, logistic system, COVID-19, Corona crisis

JEL classification: F60, H12, L91, O18

I. INTRODUCTION

The virus has the global economy in a stranglehold even after two years of the pandemic, which has led to dramatic dynamics and will have far-reaching consequences. Thousands of jobs are at risk worldwide. The automotive sector has been particularly hard hit by the crisis and the next decade will be marked by a new economic philosophy that will contribute to a society fundamentally different from our usual one.

Even before the Corona crisis, global automobile sales were regressive and fell by four percent in 2017 Wagner [1]. That was the first decline in decades, because global car sales stagnated even during the financial crisis ten years ago. Experts believe that a return to pre-crisis levels will be very difficult and with the enormous boom in electric mobility, some are even predicting the end of combustion engines. According to Zipse [2], who integrates the currently most comprehensive EU-wide statistical summary available, all available data and sources for all people employed in the automotive sector, a total of 1.4 million workers are directly affected by the crisis. Even now, after two years, there is still no end in sight of the pandemic itself, let alone the effects of the crisis on the automotive market.

But what are the irreversible consequences of the pandemic on logistics in general? What impact will the Corona crisis have on the logistics system and will this branch ever get back to the level before the crisis? Some of these questions can already be "guessed" in a more concrete way, others will probably keep us busy for years; such as the impact of the COVID-19 crisis on the logistics system and how to avoid or at least reduce the impact. In order to keep the influence of these effects as low as possible and/or to quickly return to the pre-crisis level, this research paper examines how leadership can support the minimization of effect on the logistics system.

II. THE IMPACT OF THE COVID-19 CRISIS ON THE AUTOMOTIVE INDUSTRY

The corona pandemic affects the automotive industry in many areas, one of these areas. The impact of the pandemic on employees and their behavior - the author has already described in a published publication and even researched possible leadership methods to counteract this behavior Solderits [3]. Another publication is the paper "The impact of artificial intelligence on leadership in the Corona crisis", where the author has demonstrated the connection and influence of artificial intelligence (A.I.) on this behavior of employees Solderits [4].

The table below shows the "employee behavior" in the automotive industry as a result of the Corona crisis and shows the categories in the left column. On the right side of the table in the "Leadership impact" column is the result of the author's literature research of the state-of-the-art leadership methods appropriate for each behavior. The middle column "Impact of artificial intelligence" is based on the results of the author's

research work on the impact of A.I. on leadership connected to the behavior of employees in the automotive industry in COVID-19.

Table 1. The influence of leadership and A.I. on employees' behavior in the COVID-19 crisis

Employee's behavior	Leadership impact	Artificial intelligence impact
Communication	de Vries, Bakker-Pieper and Oostenveld, 2009 [5] Ebner, 2020 [6] Harrison and Mühlberg, 2014 [7]	THOR project Kejriwal, 2019 [16]
Social imagination and decision making	de Vries, Bakker-Pieper and Oostenveld, 2009 [5] Drucker, 1967 [8] Ebner, 2020 [6] Harrison and Mühlberg, 2014 [7] Kayode, Mojeed and Fatai, 2014 [9]	Kayode, Mojeed and Fatai, 2014 [9] Rabova, Konecny and Matiasova, 2005 [17] Duan, Edwards and Dwivedi, 2019 [18]
Social habits	Grant and Hoffman, 2011 [10] Kotter, 1997 [11]	Phelps and Cooper, 2020 [19]
Adaptation strategy	Blickhan, 2015 [12] Ebner, 2020 [6] Grant and Hoffman, 2011 [10] Kotter, 1997 [11]	Stahl et al., 2021 [20]
Coping strategy	Blickhan, 2015 [12] Ebner, 2020 [6] Fook and Sidhu, 2010 [13]	Fook and Sidhu, 2010 [13] Tian, 2020 [21]
Virtual work	Ebner, 2020 [6] Thomas, 2014 [14] Harrison and Mühlberg, 2014 [7]	Susskind, 2018 [22] Kejriwal, 2019 [16] Hurst, 2020 [23] Tunyaplin, Lunce and Maniam, 1998 [24]
Fairness	Blickhan, 2015 [12] Ebner, 2020 [6] Khaola and Oni, 2020 [15]	Hughes et al., 2019 [25] Chen et al., 2020 [26]

Source: author's results

The overview shows all connections, validated by appropriate scientific research:

- Behavior of employees in the automotive industry in the Corona crisis
- Leadership influence on this behavior
- Influence of artificial intelligence and leadership on this behavior

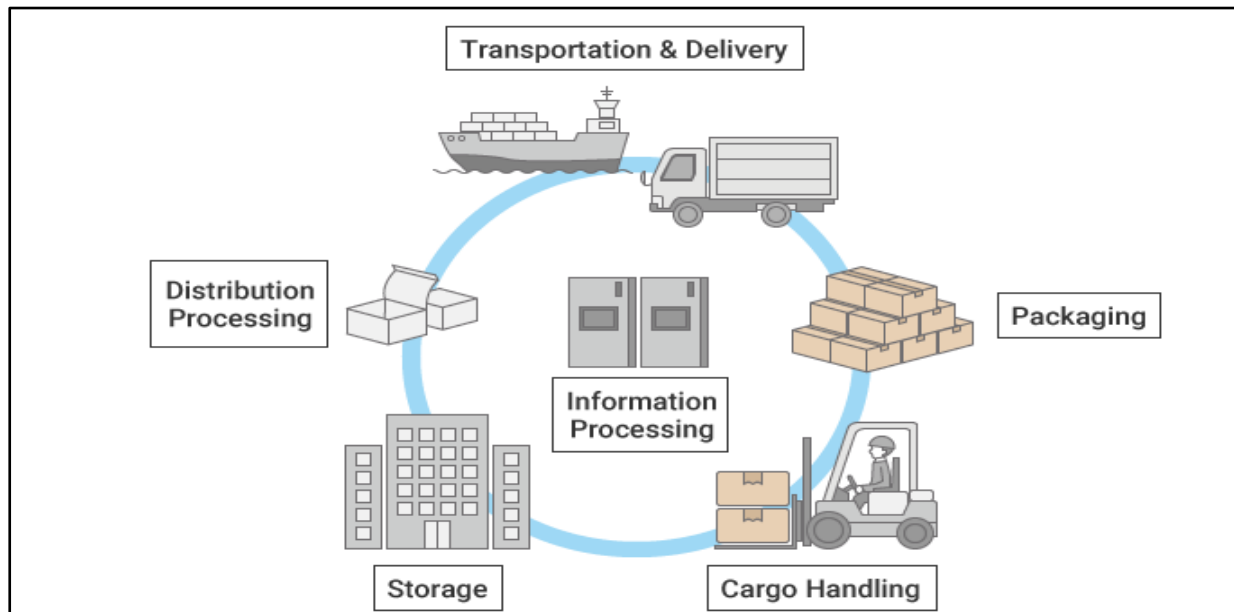
The interesting thing about this table is that it not only examines the significant connection between employee behavior, artificial intelligence and leadership during the Corona crisis, but also highlights an important characteristic. In a crisis, Markus Ebner's [6] positive leadership and the PERMA leadership approach come in handy "the answer to all problems".

In addition, the appropriate application of leadership methods by management plays an important role in ensuring that employees are well prepared to deal with crisis situations effectively and successfully in the long term. For this reason, this work could also be of interest for this research work, or at least "Positive Leadership" with the PERMA model could be named with regard to a possible basis for a solution in this research paper.

III. THE IMPACT OF LEADERSHIP ON THE LOGISTICS SYSTEM IN THE AUTOMOTIVE INDUSTRY

The system that delivers goods quickly and on time from the location of production to the consumer is the logistics flow shown below. Logistics also includes elements such as storing and packaging goods in addition to carrying and moving those goods Keyence [27].

Figure 1. Logistics system



Source: Keyence, 2022

3.1 Transportation and delivery

The key functions in logistics are transportation, delivery and truck freight. Shipping and management of those tasks is an important part of transportation, delivery, and truck freight. This is because products must be shipped correctly, on time, and as detailed in the order information supplied by the customer.

Below is the typical flow of work from shipping preparation to shipping and recording transaction after shipping Keyence [27]:

3.1.1 Shipping preparation

The picking according to the shipping instruction form is carried out. After the picked products have been checked for defects, they are packed and loaded together with the delivery note after selecting the appropriate packaging material and type of packaging.

3.1.2 Creating the shipping instruction form and necessary documents

A sales slip of the order is created based on a shipping instruction form. The shipment will be prepared and the packing slip, receipt and this shipment instruction form will be checked. The creating of the shipping instruction is the start of the "transport and delivery process" and is done mostly from computer system, served from the employees in the logistics department.

3.1.3 Shipping delivery

The products are delivered and the delivery note and receipt are confirmed by the customer and returned to the company to complete the delivery.

3.1.4 Creating a sales slip

Based on the receipt and the copy of the delivery note, a receipt is created and forwarded to the accounting department, thus completing the sale.

3.1.5 Recording the transaction

The accounting department, having received the sales slip and receipt from the warehouse, records the transaction as a sale and when the bank transfer is subsequently received, it is treated as a receivable. All work in chapter 3.1. "Transportation and delivery" can be influenced by leadership with the appropriate scientific references under "Communication and decision making" in Table 1. Leadership can also provide support in case the work packages in 3.1. are done in mobile office – the references are in the table under "virtual work".

Another reference is the paper "Leadership in space transportation", where the importance of leadership in the development of a transport service system is highlighted Greenberg [28]. The references in table 1 and the publication by Greenberg support the hypothesis that leadership can support the area of "transportation and delivery".

More than that, table 1 clearly shows that artificial intelligence can make a major contribution to this and future use should be urgently considered to optimize this process. The PERMA lead model by Ebner [6] can provide valuable support in all areas.

3.2 Storage and cargo handling

The role of storage is to continuously supply the market with goods to bridge the time gap between producers and consumers and also plays an important role in quality, especially for perishable products such as meat and vegetables. Cargo handling refers to the overall activities in warehouses and logistics centers, such as

loading and unloading cargo, transporting cargo, storage, picking and sorting, and has a major impact on productivity and quality in logistics. Cargo handling is a very important part of logistics, and cargo handling losses directly increase logistics costs. The steps for storage and cargo handling are Keyence [27]:

3.2.1 Receiving inspection

In production, the necessary raw materials and parts are purchased and shipped as finished products. The typical work in this area is the reception and checking of the cargo (quantities and quality) as well as the storage and distribution processing and packaging. Typically, this process is done using handheld computers and inventory management can be performed for the cargo from storage to shipment based on the data.

3.2.2 Taking inventory

Taking inventory is counting the products remaining on stock and checking the value of that. In a logistics center this can be a huge investment of work, time and money, but if done regularly and correctly, summing up this data can significantly reduce the inventory effort. Inventory management can be performed in real time with the help of electronic data management to make quick business decisions.

3.2.3 Picking

Picking means assembling the products for shipment and checking the item numbers and quantities of those products that are on the picking list. There are two common methods of picking:

- The single-picking method, where the products are searched and then shipped. This method is commonly used to send a large number of products to many destinations
- The total picking (sorting) method is particularly useful for shipping a large quantity of the same product type to a small number of customers.

3.2.4 Material handling

Material handling is a general term for loading, unloading, transportation and sorting, and refers to the machinery used to make it easy to move this cargo, as well as order picking and product management.

3.2.5 Sorting

The products are separated when sorting by type or shipping destination. In logistics centers, sorting is mainly automated, i.e. machines (sorters) take over the task of sorting here instead of people.

3.2.6 Shipping inspection

The contents of the shipment are checked for errors upon shipment (shipment inspection), the product is picked according to the shipment instruction form, shipment processing, inspection and packaging are carried out, and the product is shipped. Like the previous steps in the "storage and cargo handling" area, this data is recorded and managed in order to be able to carry out warehouse management and inventory. Similar to chapter 3.1., the work in storage and cargo handling can be referred as "communication", "decision making" and "virtual work", which is supported by suitable leadership methods in table 1. And again the PERMA lead model by Ebner [6] can support the work in the complete chapter of storage and cargo handling.

Another leadership reference is proven by nursery manager K. Packham, who has set about solving her setting's storage problems by encouraging staff to come up with creative solutions, using everyday objects Packham [29]. On top, these can also be optimized through the use of artificial intelligence. The hypothesis is supported that leadership and A.I. can reduce the impact of the COVID-19 pandemic on the logistics system.

3.3 Packaging

Especially in the COVID-19 crisis, the demand for distribution processing has increased in order to improve added value. If products are transported without packaging, they may break and/or the quality may be affected. This chapter describes the logistics functions of distribution processing and packaging in more detail. Products can also be better distinguished by the packaging. Typical identifiers are, for example, content designation, volume, production date, expiry date and batch number Keyence [27].

Of course, suitable leadership methods such as the PERMA model with the approach of strength-oriented leadership can help to improve work in the packaging area. Also the decision making process which packaging to use or what identifier to use is supported by appropriate leadership methods in table 1.

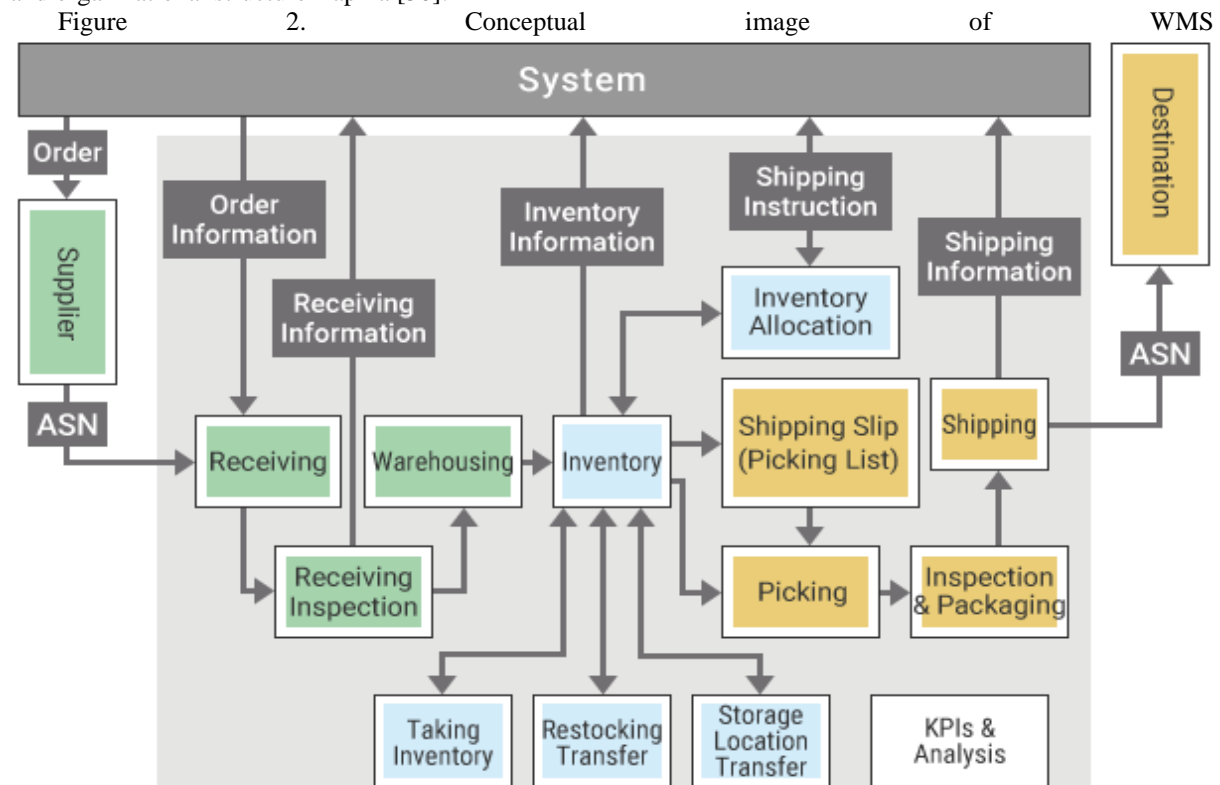
Through A.I. the logistical functions of distribution processing and packaging are also optimized or the products are automatically differentiated – the hypothesis is supported; leadership can reduce the impact of COVID-19 on the logistics system.

3.4 Information processing

Nowadays, a logistics center is only conceivable with a modern information system WMS (Warehouse Management Systems), the purpose of which is to manage the flow of goods. The logistics-specialized system can manage and take over the location, appointments and work, thus optimizing the load on the sales management system. In this way, information systems for commercial distribution and logistics can be separated and each operated with optimized performance Keyence [27].

The purpose of the research "The Influence of Leadership and Organizational Structure on the Quality of Accounting Information System" is to test and find empirical evidence on the effect of leadership and organizational structure on the quality of the information system. The overall sample consists of 49 respondents

who worked for state-owned companies (purpose-biased sampling method using multiple linear regression). There are two variables that significantly affect the quality of the information system, and these are leadership and organizational structure Rapina [30].



Source: Keyence, 2022

Information Systems (IS) governance is a critical area for many organizations as they increasingly depend on these systems for both operational stability and to enable process innovation and business strategy. IS leadership differs from leadership in general in that an in-depth understanding of the organization must be combined across all functions from operational to strategic. Thus, unique leadership challenges arise due to the technology/business interface. This essay discusses the distinctive aspects of IS leadership, identifies the dominant themes in previous IS leadership research, and presents five articles on IS leadership related to this issue Karahanna and Watson[31].

Based on the references in table 1, as well as the paper by Rapina [30] and Karahanna and Watson[31] the hypothesis is supported. Leadership can reduce the impact of the COVID-19 crisis on information processing, a part of the logistics system.

Information processing is the prime discipline of artificial intelligence, which can optimize the system and, thus, control the flow of goods and optimize the sales management system.

3.5 Distribution processing

The distribution process refers to all the processing involved in shipping products that are carried out in the logistics center; for example, grouping products into sets, applying labels, or packing products in plastic bags. Attaching price tags is also a typical job in this area. Whatever is done, the goal is to create an added value - primarily for the customer, but there are also advantages for logistics.

Especially during the COVID-19 pandemic, demand has increased for cost reasons because it is cheaper and safer to carry out distribution processing in a logistics center Keyence [27].

Appropriate leadership methods can support the distribution process, which means certain transactions related to the shipping of products that are carried out in the logistics center with reference to "communication", "decision making" as well as the paper by Greenberg [28] and Packham [29]. A.I. can optimize these processes and, thus, increase the added value, referred to in table 1 by "communication" and "decision making".

IV. CONCLUSION

All areas of the logistics system, visualized in figure 1., are supported by the appropriate leadership method with references in table 1. In the chapter "Leadership in logistics" in the book "Cloud computing strategies", the author points out the importance of leadership and customer relationship management Chorafas [32]. This book is of interest, because it was written in 2010 with the first ideas of cloud computing and today -

and especially now in the COVID-19 pandemic in particular - cloud computing is one of the most essential requirements for virtual work and mobile office. Only through cloud computing it is possible for several people in a company to access, edit and save a file in the cloud from anywhere in the world. All they need is an internet connection.

With the references from the author in table 1 and the additional references from Greenberg [28], Packham Rapina [30], Karahanna and Watson [31] and Chorafas [32], the hypothesis is supported, leadership can reduce the impact of the COVID-19 pandemic on the logistics system.

Furthermore, there is also a big improvements and optimization of all areas in the logistics system possible by artificial intelligence, especial in the area of the decision making process, which is the superior discipline of A.I..

Application of that research paper can be the positive leadership method with the PERMA lead model from Ebner[6], as well as the implementation of A.I. for the whole logistics system.

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V. FIGURES AND TABLES

Table 1. The influence of leadership and A.I. on employees' behavior in the COVID-19 crisis

Figure 1. Logistics system

Figure 2. Conceptual image of WMS

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