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New trends in the home logistics management model in urban contexts

Nuevas tendencias en el modelo de gestión logístico de domicilios en contextos urbanos

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Abstract

With the majority of goods delivered ending up in city centers, last mile logistics is known to be the least efficient stage of the supply chain, comprising up to 28% of the total delivery cost. The main objective was to determine how the use of autonomous transportation technologies changes the home logistics management model. Positivist paradigm research, with quantitative method and descriptive-correlational approach, field research and non-experimental-transversal design. The sample was 28 courier companies, with at least one year of experience and a plant that includes at least five (5) full-time workers. The survey technique is used, using a collection instrument with a Likert-type scale. The results suggest that in general terms, the dimension that characterizes the state of implementability of new trends in the package logistics management model is present in this study. In the current context, companies are not yet at the maximum point of possibilities in terms of the implementation of new trends, if there is a will of the union to adapt every component that supports or optimizes the operation, for which there is a margin of opportunity for the adaptation of these in the local context.

Keywords: Autonomous vehicles; Technological management; Transportation systems; Urban logistics.

Resumen

La mayoría de los bienes entregados terminan en los centros de las ciudades, se sabe que la logística de última milla es la etapa menos eficiente de la cadena de suministro y comprende hasta el 28% del costo total de entrega. El objetivo principal fue determinar cómo cambia el uso de las tecnologías de transporte autónomo el modelo de gestión logística de domicilios. Investigación de paradigma positivista, con método cuantitativo y enfoque descriptivo-correlacional, investigación de campo y diseño no experimental-transversal. La muestra fue de 28 empresas de mensajería, con por lo menos un año de experiencia y una planta que contemple por lo menos cinco (5) trabajadores a cargo. Se utiliza la técnica de encuesta, utilizando un instrumento de recolección con escala tipo Likert. Los resultados sugieren que, en términos generales, la dimensión que caracteriza el estado de implementabilidad de nuevas tendencias en el modelo de gestión logística de paquetes, se muestra presente en este estudio. En el contexto actual las empresas aún no están en el punto máximo de las posibilidades en cuanto a la implementación de nuevas tendencias, si existe una voluntad del gremio por adaptar todo componente que apoye u optimice la operación, por lo cual existe un margen de oportunidad para la adaptación de éstas en el contexto local.

Keywords: *Gestión tecnológica; Logística urbana; Sistemas de transportes; Vehículos autónomos.*

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Introducción

Online sales and globalization lead to new trends in the transportation of goods and, furthermore, with the trend of urbanization of population groups, a greater amount of goods are expected to be delivered in the near future [1]. Most delivered goods end up in city centers, last mile logistics is known to be the least efficient stage of the supply chain, comprising up to 28% of the total delivery cost [2]. Therefore, improving last-mile logistics and a significant reduction in costs and eventualities are very important challenges for researchers in this area [3].

When it comes to urban deliveries, several future models are planned. However, automotive technology is mentioned in several different documents [4]. The actual introduction of self-driving cars could be close in the coming years [5]. Autonomous trucks with package lockers could be used in two different ways [6].

In the first way, the vehicle could drive itself to the customer's address, and if the truck is programmed to deliver packages, a compartment could be reserved and a package could be placed in it, then the truck would drive autonomously to the address. and the recipient could open the compartment using a personal identification number (PIN) code [7, 8].

In turn, for the second, more economical form of operation, autonomous ground vehicles could function similarly to normal parcel lockers and serve as collection points [9]. The autonomous truck would inform customers of the area and, for a long time, they would be able to pick up their packages [10]. The biggest advantage compared to current package lockers would be the opportunity to move the entire truck to another area. Thus, a truck could always park in the proximity of customers or in “easily accessible places” McKinsey and Company [11].

Autonomous vehicles will deliver 80 percent of packages in the future, and they conclude that an autonomous drone delivery model would only be viable in rural areas [12]. Of course, this statement was made based on the technologies in force at that time. Therefore, work is currently underway to overcome the key challenges that must be addressed, such as design, localization, navigation, vehicle coordination, and additional related challenges that include privacy, security and government regulations [13]. For all the above, in this work we determined how the use of autonomous transportation technologies changes the home logistics management model.

Theoretical Foundation

Online sales and globalization lead to new trends in the transportation of goods and,

furthermore, with the trend of urbanization of population groups, a greater quantity of goods is expected to be delivered in the near future [14]. In this context, the majority of delivered goods end up in city centers. Added to the above, it is known that last mile logistics is the least efficient stage of the supply chain and it comprises up to 28% of the total delivery cost [15]. Therefore, improving last-mile logistics and a significant reduction in costs and eventualities are very important challenges for researchers in this area.

When it comes to urban deliveries, several future models are planned. However, automotive technology is mentioned in several different documents, underlining that the actual introduction of autonomous cars could be close in the coming years, they mention that autonomous trucks with package lockers could be used in two different ways [16].

In the first way, the vehicle could drive itself to the customer's address, and if the truck is programmed to deliver packages, a compartment could be reserved and a package could be placed in it, then the truck would drive autonomously to the address. and the recipient could open the compartment using a personal identification number (PIN) code [17].

In the second, more economical form of operation, ground-based autonomous vehicles could operate similarly to regular parcel lockers and serve as pick-up points. The autonomous truck would inform customers of the area and, for an extended period of time, they would be able to pick up their packages. The biggest advantage compared to current package lockers would be the opportunity to move the entire truck to another area. Thus, a truck could always park in the proximity of customers or in “easily accessible places” [18].

The examples mentioned above show that autonomous trucks could be combined with other delivery methods, such as drones, androids or robots, which could be significantly improved. As for autonomous aerial vehicles or popularly known as drones, the use of this technology in package delivery services is a fast-growing industry that has attracted a lot of commercial attention from companies such as Amazon, DHL and Google [19].

Several of these companies are testing drone delivery services. They all have awesome videos showing their systems in action. These videos have in common that the drones are delivering a package in a farm or open space, with no other house in sight [20]. However, the majority of the current population lives in large, densely populated cities, where delivery logistics with aerial drones is affected by unforeseen events that range from finding an optimal route within a city full of obstacles, to problems finding the apartment. correct, which will often require the execution of high precision maneuvers [21]. For this reason, there are currently still active research groups aimed at improving this aspect to offer degrees of reliability that allow its implementation in places with a high density of buildings and population [22].

Regarding storage and delivery systems, the authors Ranieri et al. (2018) [23]. mention that the Using proximity stations or proximity points is an innovative strategy to improve the efficiency of last mile delivery, especially for distributing small and medium-sized goods. This approach is based on the use of a warehouse station where products can be stored when customers are not at home until they can collect them, thus avoiding the risk of failed delivery [24].

The proposed idea reduces costs due to the shorter distance traveled by the means of transport and a higher load factor of the means of transport. Furthermore, with appropriate measures, delivery time is reduced and efficiency increases since

it is possible to fill the stations at night, when traffic is low, which generates both economic and environmental benefits [25]. These models can be located in residential neighborhoods, within shopping centers, central squares, etc. The proposed delivery system uses electric vehicles since the transportation distances are very short. A similar strategy is package lockers; They achieved great use in recent years as in the case of the Polish InPost Company system [26].

These systems have been adopted by many logistics operators such as DHL for deliveries to customers; The Austrian Post introduced Post24 parcel machines to store and send parcels at any time of the day and night. Today, several e-commerce companies (e.g. Amazon, eprice and others), in addition to home delivery, use the proximity point concept for customer pickup of goods [27].

Methodology

The research work is framed in the positivist paradigm, with a quantitative method and descriptive-correlational approach, field research and non-experimental-transversal design [28]. With respect to the study population, it is necessary to study the characteristics of the parcel service providers, the sample was 28 courier companies, the selection criterion for choosing the companies to characterize was small and medium-sized urban courier companies that They operate only locally, El Centro is a company with at least one year of experience and a plant with at least five employees.

The survey technique was used, using a Likert scale collection instrument and whose alternatives were: Totally agree, Agree, Neither agree nor disagree, Disagree, Totally disagree. The statistics are descriptive, frequency distribution and measures of central tendency were used. In the study carried out, a point of comparison was established to interpret the data collected. The objective of this was to compare the results obtained during the data collection process, based on the arithmetic mean and established on a scale from 1 to 5, which corresponds to the lowest and highest possible value of the response scale used in the data collection instrument applied. for later study population. Table 1 below shows the scale used for the average analysis of the indicator in this research.

Furthermore, to complement the results of the study, measures of dispersion were calculated, specifically the standard deviation of the arithmetic averages obtained for each dimension and indicator through the use of the instrument. For these dispersion measures, a corresponding scale was established, ranging from 0.00, which is the minimum value, to 1.74 as the maximum value of the standard deviation. Next, in Table 2, the scale used for the analysis of the data collected from the application of the items of the data collection instrument in this research is presented.

TABLE 1.
WEIGHTED SCALE FOR THE ANALYSIS OF AVERAGES

Courage	Alternative	Intervals	Categories	Convention
5	Totally agree	4,20 – 5,00	Very present	MP
4	Agreed	3,40 – 4,19	Present	P
3	Neither in agreement, nor in disagreement	2,60 – 3,39	Moderately present	MEP
2	At odds	1,80 – 2,59	Poco presente	PP
1	Totally at odds	1,00 – 1,79	Absent	A

TABLE 2.
WEIGHTED SCALE FOR STANDARD DEVIATION ANALYSIS

Courage	Intervals	Categories	Convention
5	1,39 – 1,74	Very high dispersion	MAD
4	1,05 - 1,38	High dispersion	ALD
3	0,70 – 1,04	Intermediate dispersion	DI
2	0,35 – 0,69	Low dispersion	BD
1	0,00 – 0,34	Absent dispersion	AD

Results and discussion

Table 3 presents the results obtained for the dimension New trends in the package logistics management model, whose indicators aim to measure the knowledge of the population studied in: New trends in logistics process management, New trends in media freight transportation and New trends in storage and delivery systems.

Firstly, in the indicator that measures the level of knowledge about new trends in the management of the logistics process, it is evident that 64% of the general managers of home delivery companies respond that Almost Always and Always identify factors for improving the management process logistics within your company, in addition to some degree of knowledge of customer preferences in addition to the possibilities regarding the organization of systems to improve the relationship with the customer CRM (Customer Relationship Management) with the support of information technologies, a 25 % indicate sometimes, while 12% report almost never and never knowing or applying these types of strategies.

This result shows that the aforementioned indicator is present in the population under study, with an average of 3.47 according to the scale established for data analysis. Likewise, a standard deviation of 0.79 is obtained, which indicates an intermediate dispersion of the responses.

In the case of the indicator that measures the assimilation of new trends in means of transportation of goods, it is observed that 54% of general managers of home delivery companies respond almost never and never consider the technological options presented in the survey as viable options for implementation within their work context , while 21% indicate that they sometimes take them into account, and 25% report that they have almost always or always reflected on the possibility that they are viable options for the future of the operation of this type of business.

In this case, the results show that the indicator of new trends in means of transportation of goods is moderately present in the population under study, with an average of 3.71 according to the scale established for data analysis. Likewise, a standard deviation of 0.88 is obtained, which indicates an intermediate dispersion of the responses.

For the third indicator that measures the level of incorporation of new trends in storage and delivery systems, it is observed that 60% of the general managers of home delivery companies respond almost always and always consider that there are components that promote the implementation of new trends in package storage and distribution systems, which involve the application of technological innovations to optimize these processes. On the other hand, 24% indicate that they have sometimes identified

these driving components of innovation in this aspect, while 16% expressed that they almost never envision the questioned approaches as options to implement in the near future.

Considering these results, the general average places the dimension corresponding to new trends in the package logistics management model in the present category, with an average of 3.47 according to the established scale. Additionally, the standard deviation of the dimension is estimated at 0.79, which indicates an intermediate dispersion in the general responses of the dimension.

The results immediately presented suggest that in general terms, the dimension that characterizes the state of implementability of new trends in the package logistics management model is present in this study, which was to be expected given that although in the current context companies are not yet at the maximum point of possibilities in terms of the implementation of new trends, if there is a will of the union to adapt every component that supports or optimizes the operation, for which there is a margin of opportunity for the adaptation of these in the local context.

These results are supported by Ranieri et al. [23], highlighting a series of advances in the logistics field that have the potential to revolutionize package delivery. These include the implementation of innovative vehicles, the promotion of collaborative and cooperative urban logistics, and the optimization of transportation management and routing. From this review, it is deduced that the future of smart logistics will lie in the fusion and effective application of these concepts and innovations, suggesting a profound potential for change in the package delivery logistics system.

TABLE 3.
NEW TRENDS IN THE PACKAGE LOGISTICS MANAGEMENT MODEL

Indicators/ Items	Never		Hardly ever		Sometimes		Almost always		Always		Total		$\bar{X}$		σ	
	Fa	%	Fa	%	Fa	%	Fa	%	Fa	%	Fa	%				
New trends in logistics process management / 35, 36,37,38,39, 40	1	1%	18	eleven%	42	25%	101	60%	6	4%	168	100	3.55	Q	0.75	GAVE
New trends in means of transportation of goods/ 41, 42,43,44,45, 46, 47	2	1%	104	53%	41	twenty - one%	47	24%	2	1%	196	100	2.71	– MEP	0.88	GAVE
New trends in storage and delivery systems/ 48,49,50,51, 52, 53	0	0%	27	16%	40	24%	96	57%	5	3%	168	100	3.47	Q	0.79	GAVE
							Half ($\bar{X}\bar{X}$)general dimension General dimension category (Mean $\bar{X}\bar{X}$) Overall dimension standard deviation (σ) General dimension category (Standard deviation σ)						3.47 Present (P) 0.79 Intermediate Dispersion (ID)			

Conclusion

The results suggest that in general terms, the dimension that characterizes the state of implementability of new trends in the package logistics management model is present in this study. The above is based on the fact that, although in the current context companies are not yet at the maximum point of possibilities in terms of the implementation of new trends, if there is a will on the part of the union to adapt every component that supports or optimizes the operation, Therefore, there is a margin of opportunity for their adaptation to the local context. These include the implementation of innovative vehicles, the promotion of collaborative and cooperative urban logistics, and the optimization of transportation management and routing. From this review, it is deduced that the future of smart logistics will lie in the fusion and effective application of these concepts and innovations, suggesting a profound potential for change in the package delivery logistics system.

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