INTERNATIONAL JOURNAL OF RESEARCH IN TECHNOLOGY AND MANAGEMENT (IJRTM)
ISSN 2454-6240
www.ijrtm.com

THE ROLE OF VEHICLE AUTONOMOUS TO ACTIVATING DRIVERLESS INDOOR TRANSPORT SYSTEMS

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ABSTRACT

Trends in vehicle usage are constantly increasing in all modes of transport and overshadowing both public transport infrastructure and internal corporate transport, in order to improve productivity, reliability and flexibility in transportation. To effectively implement automation, there are many requirements to be implemented, in terms of both technology and infrastructure.

KEYWORDS- SUPPLY Chain; Self-Transportation; Cargo; Shipping; Adaptive Cruise; Control Road Planning.

I. INTRODUCTION

The automation technique plays an important role in transport operations in order to reduce overcrowding and minimize human errors, leading to savings of time and its impact on efficiency, quality and efficiency, in order to improve productivity and achieve quality in transport operations. In view of the increasing information density and the complexity of geographical division of labor, Current research on commercial traffic. Where about one-third of the transport of goods is concerned, since the location of raw materials or the production of finished goods rarely coincides with the place of demand for goods. The transportation itself does not add any material value to the final product or products under manufacture but adds added value. For this reason, it is here that applications are developed where the transport process can take place without a driver for internal logistics in the early 1950s. The so-called driving robot has been developed primarily for special tasks in serious or inaccessible situations. The mechanized, non-driver and partially independent vehicles were formerly engaged in the long-term transport of goods into production and logistics systems.

The most important question is the extent to which motor vehicles can also be fully used to transport goods on the road through public infrastructure. The main question is divided into several sub-questions, such as the degree of satisfaction with the technology, the technological, regulatory and legal requirements for implementation, and the degree of change and responsiveness to the logistics, supply chains and transport of goods as a result.

This paper also provides a clear understanding of the motivation of companies to implement driverless transport systems and the individual experience of decision makers in the company. Using case studies from the field of logistics and shipping, research will also be conducted in the current application areas, addressing the concept of navigation and the required safety limits for self-driving as well as control operations. To identify the outlines of the specific use cases for the carriage of goods and how to neutralize other independent systems developed in parallel with the automation, such as unmanned aerial vehicles, and then entirely new business models evolving in the area of logistics. What changes are expected in logistics processes and the role of human labor in systems?

II. THE HISTORICAL DIMENSION OF THE DEVELOPMENT OF DRIVERLESS SYSTEMS AND SELF-GOVERNANCE

First, AGTs and AGVs were used for commercial purposes in the early 1950s in the United States and about 10 years later in Germany [1]. The primary motivation was the obsession with improving the flow of materials and reducing the human role, as a logical consequence of prevailing and logical ideas for ways to increase productivity by improving the processes that had been in operation since the early nineteenth century (Frederick W. Taylor) A production process by itself "Gilbert System" for the production of the continuous assembly line (Henry Ford). This development was driven by a focus on mechanization of production due to the increasing tendency and emphasis on technology by the administration, to the extent of conceiving the full automation [1] from automation of auxiliary transport processes between the stages of production processes, where the first AGT systems were used in production and warehousing. Compared to automatic transport systems, such as conveyors, investments are generally significantly lower and more flexible while changes in material flow are much higher [2]. While transport is considered a non-productive activity but has high added value, there must be high reliability in production systems and warehouses.

2.1 Internal transport systems without driver

Typical internal applications of AGT systems were designed to link production and assembly operations, between them and the inbound and outbound cargo areas, as well as the selection, sorting and warehouse areas. AGT systems and work robots, such as selection systems, mobile platforms, etc., are often combined into one machine. In the field of internal logistics, the confrontation between humans and the proposed mechanisms for the implementation of AGT / AGV systems has always been AGT / AGV systems generally perform other functions as well, such as support for the selection process. Development of personal safety concepts and implications for mechanical processes [2]. At present, laser scanners are widely used, can cover up to 7 meters [2] and are often combined with other sensor techniques. The level of installation also plays a relatively small role in internal transport as the company itself has the floor surface in the case of driving.

Application in early systems was accomplished through the implementation of the routing level in the internal component of internal transport operations generally by electrical conductors embedded in the flooring. Today, the following different types of positioning and locator identification can be distinguished: [3] On the other hand, this physical evidence, which is implemented either as an active induction route, has been included as a magnetic strip or visual guide path. Free navigation techniques using ground markers (metals, magnets, transmitters and receivers) or laser technology where positioning can be found in a maritime-like manner can be found. Modern technologies combine scanners, camera systems, and digital environment maps, enabling mobility according to environmental characteristics.

Where data was transferred between fixed and mobile units in the AGT system previously using the data transfer inductive or infrared. At present there is a narrow band and increasing broadband (WLAN) is predominant. (GPS) with an accuracy of up to 0.5 m, with external GPS accuracy of 10 m, dGPS (differential GPS) with accuracy of up to 1 m and dGPS with a thorough evolution of 0.1 m . Vehicles are also assigned to command functions and are coordinated [2]. The concept of control consists of a control unit through which the transport order is executed, the transport order is handled, vehicle allocation is carried out and transport is implemented centrally. Through a traffic control system that is part of the vehicle's task execution. The removal of individual parts of the track is very much done with the rail system in block sections that can only be filled by one vehicle at a time. One of these systems is implemented at the distribution center of the logistics provider in 2011 [3]. In the capture process, the AGT systems are used to transport the capture tool by car. The ejector safety is ensured through many measures, as is consistent with safety regulations

Which requires passengers to take a certain position with their hands and feet. Therefore, other activities can not be carried out while the car is moving. The concept of operator safety is also based on laser scanners. In addition to navigating the manual magnetic point sequence system, the control system uses wireless technology for data transmission. The AGT / AGV control system will also be centrally handled in new systems. Therefore, the expansion of systems is always associated with more large investment expenditures, so the search for independent decentralized control solutions is ongoing.

One example of this is the self-access forklift truck developed through the Marion Project (Mobility, Self-Movement, Collaborative in Complex Value Creation Chains), developed in part as Autonomik For small and medium enterprises) through the technology program. Vehicle tasks are set by the superordinate system. The forklift operates to perform the task independently through calculations and determine the optimal route independently. It is equipped with three-dimensional laser, laser scanner and 3D environment detection cameras. Through sensors, the forklift can accurately assess the environment, dimensions and location of objects.

One example of a decentralized control system has been developed through the project "Self-centered decentralized self-control for vector-guided transport systems" [4]. In this system, different agents are designed for each vehicle. Through road planning and task alignment, tasks are carried out collaboratively. The simulations showed a decrease in the total path distances of all AGV vehicles, a decrease of approximately 8% in the blank trip, a 22% reduction in time-out times and a slight increase in AGVs [5]. At the Fraunhofer Institute for Material Flow and Logistics (IML), a squadron intelligence-based mobile transport system was developed in the Intelligence Squadron Logistics project. In this system, the squadron (transportation) receives transport functions, takes the nearest task car and sets the shortest route dynamically, as in the Ober and Karim systems.

2.2 Outdoor Automated Guided Vehicles on Private Property

One example of a decentralized control system has been developed through the project "Self-centered decentralized self-control for vector-guided transport systems" [4]. In this system, different agents are designed for each vehicle. Through road planning and task alignment, tasks are carried out collaboratively. The simulations showed a decrease in the total path distances of all AGV vehicles, a decrease of approximately 8% in the blank trip, a 22% reduction in time-out times and a slight increase in AGVs [5]. At the Fraunhofer Institute for Material Flow and Logistics (IML), a squadron intelligence-based mobile transport system was developed in the Intelligence Squadron Logistics project. In this system, the squadron (transportation) receives transport functions, takes the nearest task car and sets the shortest route dynamically, as in the Ober and Karim systems.

2.3 The role of automated vehicles directed outdoors on private property

Of the external applications of self-governing autonomous vehicles are the AGT heavy transport systems or the common shuttle traffic within the plant, as in the container terminal, where the mechanical vehicles are transported containers between the container cranes and the stacking area of sidewalks and squares [6]. In order to achieve the goal of shortening roads, reducing empty flights, optimizing the use of all resources and reducing carbon emissions. In this case ground-based GPS receivers and receivers are used. So that the road is planned independently, as well as battery changes. Coordination is also controlled by transmission of radio data.

There is a major collaboration from truck less, a company that was originally active in the radio technology sector. In 2012, for example, the company carried out a driverless bus between the production and logistics buildings at the dairy factory [7]. The pallets loaded with fresh products and packaging materials shall be loaded and unloaded automatically. The lane routing system is used by the transceivers installed in the path. The sensor utilizes a drag vehicle that uses markers on the ground to determine direction and determine the path. With the help of rear axles for steering, vehicles can also drive small envelopes and achieve positioning accuracy within 2 cm. Laser scanning scanners, emergency keyboards and emergency stop buttons to ensure the safety of people, goods and the vehicle itself.

The project ["Safe Transport Self-Transport and Transport Vehicles"] has led to further developments that have made the confrontation between AGT systems, trucks and people in the external environment safer [8]. In the external environment, the concept of safety consists of radar sensors, because laser scanners are not allowed. Environmental scanning through portable and fixed sensors enables safe operation at higher speeds (economic responsibility).

2.4 Use of self-transport vehicles for road transport outside the factory grounds

Independent vehicles for the transport of goods and logistics outside the factory's territory are developed primarily in order to solve the problem. The so-called command of robots developed for use in dangerous situations, such as cases of disarming munitions, or for use in hard-to-reach areas such as deep sea exploration, working on mountain sides or in dense forests and remote areas such as work in the mining sector. Large trucks with large engines with a maximum load capacity of 290 metric tons have been used in one of the largest iron ore mines in Australia since the 1990s [9]. The reasons for their development were primarily employment difficulties, serious transitions in remote areas and logistics requirements in terms of staff planning and staff relocation.

To be navigated through radar and laser as well as through the use of road points for guidance. With possible monitoring and interference options via an operation center using wireless transmission. The control over the GPS system and the dead account, such as ships or aircraft, is transferred through continuous positioning by measuring the path, speed and time.

2.5 Develop independent leadership and independent vehicles in other modes of transport

Other modes of transport, using technical systems for stabilization, navigation (such as digital maps) and knowledge of the environment, have seen increasing degrees of automation. Where aircraft have been equipped with stabilization systems since the early 20th century, and the functions of autopilot have become a long-established feature, the first drones in Germany are already used in military, police and firefighting applications. Unmanned aerial systems or unmanned aerial vehicles (UAVs) are also used in civilian applications in other countries, replacing farmers and inspectors, for example in remote areas. By monitoring drones in seed field and performing pest control functions. Small unmanned aircraft are also being used in Germany, for example to check for damage caused by storms or fires, in film production and industrial inspections. Deutsche Bahn (Germany's largest rail company) is testing unmanned aircraft to monitor vehicles and infrastructure. There are also ongoing empirical studies in the field of commercial goods transport, especially parcels. With a carrying capacity of up to 2.5 kg and a range of up to 15 km, for example, current drones can be used to deliver food or medicines. An unmanned drone was also tested for defibrillation. UAVs for commercial purposes greater than 5 kg are generally permitted in many federal states, though not in controlled airspace. [10]

Preliminary studies are conducted on unmanned aerial transport (see the European research project MUNIN). Unmanned submarines have been used for some time. The concepts of UAVs are also developed by various actors. In road traffic [11]. Here, unlike air traffic, ships can be taken on board at any time, for example, in high-traffic areas such as ports to ports. As a rule, these systems will not work independently, even in the future. Although dodgy maneuvers can be independently transferred, it can be assumed that centralized monitoring and remote control will remain common practice,

Remote control of rail systems is also an important hub for maritime transport, excellent transport and the lowest cost per unit where trains have been operating without driver for years. While independent command includes free navigation and will be useful only for very small units. So far, attempts to introduce smaller freight transport units on railways such as Cargo Sprinter have not been successful. This is due to the fact that there is no fast train configuration technology, so it is necessary to transfer power separately for each vehicle. Hence the shortage was addressed by the concept of the Rail Cab [12]. Self-propelled, linear-driving vehicles use the wheel and track system. The train combination is moved through an electronic pull rod. This is costly and there are a few appropriate applications that the truck can not make the transport in. On major transport routes, efficiency gains are counterbalanced by economies of scale with undetermined guidance and the formation of a changing convoy. But there can be economically viable applications on non-electrified substructures. However, there are still no known studies comparing environmental and economic impacts under market conditions.

AGT systems consist of the routing control system, especially for order allocation, route planning, communications system and vehicle [4]. (AGTS / AGV) internal transport systems with low levels of automation have been around for a long time. The degree of automation has also increased with advances in technology, albeit in ways different from public road transport. So that the orientation of the machine applied to the design of such systems can be determined to understand safety concepts clearly and accurately. In the past, however, it was enough to have AGTS / AGV's internal logistics capable of moving in the direction, generally in scenes where people are accustomed to vehicles that do not have a driver. In some cases, people and vehicles are physically separated. In short, safety concepts are limited to the minimum because AGT / AGV systems operate at low speeds and in known and clearly defined circumstances. Technological developments have also focused on the proper implementation of transport functions and other associated tasks such as loading and unloading of goods. However, it may be assumed that the agility requirements of AGT / AGV systems will increase as production moves away from linear assembly lines and the production and selection systems themselves become more flexible. At present, independent proxy-based systems appear to be the most appropriate to address increasing data volumes and increasing complexity, due to decentralized data availability and decision-making processes.

External solutions for the transport of goods are based on traditional road vehicles and so far have been used only on a regular basis in the company's own land. There are only a few cases of use that can be referred to. But similar developments in the closed zone can be envisioned in general.

The question with AGT / AGV systems is how future unit autonomy will be developed. Automatic control and driverless movement are always AGT / AGV components. The degree of autonomy is defined as the number of degrees of freedom. This depends, for example, on the free choice of route and the speed to move independently to the destination even in changing environmental conditions.

The use of mobile devices represents a point of contact between work robots and vehicles. As with internal transport systems, the transport task is frequently combined with other "productivity" tasks. These are mostly teleworking systems. Therefore, independent decision-making in determining the course is not generally the case. This also appears illegally to create value added in the largest possible applications.

In the early stages, the conceptual design of automation solutions was based on how to use it. Where elements of the established system are also found, as is generally the case in the newer conceptual approaches, especially with regard to the concepts of vehicle and operator safety. With the emergence of decentralized concepts that use new information and communication technologies, various system solutions have managed to achieve greater convergence. Specifically in situations requiring flexibility and high speed, where technological solutions are becoming increasingly similar. With it varying in terms of degree of autonomy.

III. CASES OF USE IN THE AREA OF INDEPENDENT CARGO TRANSPORT

Depending on the cumulative experience, the potential applications of independent vehicles in the area of cargo transport will be strictly determined using general use cases. To focus on the transport of a particular commodity through the movement of land freight. There are more likely applications in other sectors of commercial transport such as passenger transport and cargo transport in the context of production (self-driving machines).

Based on the conceptual description of the relative use case and in view of the specific features, an initial assessment of the benefits, opportunities and risks of the introduction of such technology will be discussed. However, the examination will begin with the study of the lessons of driving automation for the transport of goods, in order to better distinguish between the effects of different uses.

3.1 Displacement: degrees of automation in independent freight transport

To assess the necessity and benefits of a certain degree of automation in the carriage of goods, we will first return to the definition of the command function according to [13], where it is described as follows: requires safe implementation of the command function Information and knowledge about the state of traffic level routing area, Level of stability, as well as road network at the level of navigation. Hence the safe behavior of the car requires guidance, speed and overall, in addition to speed decisions and of course for lateral and side control in the car. To make the necessary decisions on the basis of information on environmental conditions and associated knowledge of the actions to be taken.

Automated leadership is classified into four levels of development [14]: driving with the help of (1), partially automated driving (2), highly automated driving (3) and fully automated driving (4). In the first three levels, the system achieves partial aspects of the leadership task for a specific period and / or specific situations. But the driver is available at least as a supervisor. For the last level of fully automatic driving, [14] it is assumed that the car is moving freely and there is no need for a driver as a reserve level.

In the area of transport of goods, there are automatic transport systems directed even at low automation levels. With an average level between (3) and (4), another related variable can be observed in the transport practice: the car is highly automated and without driver, but no free navigation is performed. In many cases, the car is controlled remotely by a player via a control center.

3.2 Cases of use for independent transport of cargo

Already partially subsidized and automated systems are common in supply chains. Where the need for longitudinal and / or lateral control of the car for a certain period of time and / or in specific positions. In auxiliary systems, the driver is warned. In partially automated systems, the control system is guaranteed. The inevitable problem is to provide motivation - for example brakes - by the driver. The most popular driver assistance systems (DAS) are anti-lock braking systems (ABS) and electronic stability (ESP) programs. Due to extreme traffic accidents, lane change and warning systems are not allowed to leave corridors and adaptive cruise control functions are mandatory for new vehicles ahead of schedule in 2013. Other systems are under development or already ready for production, such as extension control systems, corner systems or parking systems the cars. They focus primarily on helping the driver at the steering and stability levels.

To ensure that fully automatic and automated vehicles are secured and moved freely; they can be independent from the situation and infrastructure. Automated systems can operate without a driver. Not only the mobility-level activities that the driving robot assumes, but also the activities needed to bring the system back to a less serious state when the components fail.

Through the perspective of shipping and logistics movement, technological solutions to levels of stability and guidance are not the main focus. The most important in this range are potential usage cases with and without drivers and free mobility. A thorough examination of the following differences should be made in cases of use:

1. 1.Interstate pilot as driving on highways is highly automated with driver and free mobility;

2. 2.Vehicle upon request as the road driving is highly automated without driver and with free shipping.

3. Complete automation using the driver for the vehicle with extended availability such as high automatic driving without driver and without free navigation (lost use case 3/4)

4.Valet parking and driving are very automated without driver and without free shipping (missing use case 3/4).

Below, the use cases will be presented and the initial arguments in favor of and against the degree of autonomy in logistics and shipping. In each case, it will be evaluated to what extent the use cases in the cargo traffic system coincide with "independent driving use cases" of private transport, what differences exist and what the implications are for implementation.

3.3 Intercity Highway with driver and free mobility

The Interstate trial describes the state of use in which the autopilot function is used, but with the availability of the driver at all times. Where the driver delivers the level of installation and guidance (and also navigation) to the autopilot, preferably after the destination address is specified. It is intended to use the highway between the entrance and exit of the highway. Ensure that the driver controls when faced with unclear driving positions (such as construction areas).

The supposed benefits of inter-city pilots are provided by reducing accidents and improving traffic flow. Drivers are often close to their performance, especially in traffic jams or stop-traffic situations, but also on long, monotonous trips, as well as the ever-increasing pressure in modern life. In addition to loading the driver from the stressful driving positions, the intercity pilot also creates free time that can be used for other purposes. There are deliberations here on whether activities such as road planning and fleet management may not be decentralized. Where the first case of application was reported from early 1987, when the University of the Armed Forces in Munich, Germany, was experimenting with a truck driving on a highway [15]. In 2013, the manufacturer of the Scania vehicle made a truck that can "independently accelerate, equipped with brake and steering" at speeds of up to 50 km / h [16]. In 2014, Daimler had a truck up to 85 km / h amid other vehicles in a closed section of the highway [17].

Where the pilot between cities is primarily envisaged to enable full automatic driving. However, due to security considerations, the concept is still dependent on the available driver, which in effect reduces the scenario of being very trustworthy. The maximum effective speed and maximum allowable mass also require different safety concepts for private transport.

Changes are expected in the first place in terms of the driver's description. Drivers are now required to identify vehicle technology and payloads. How long does the driver continue to perform a technical inspection of the vehicle? What are the economic and environmental benefits associated with the concept?

3.4 Car on demand without driver and free shipping

On-demand vehicle is similar to the case of use, which is known as the independent and decentralized AGT / AGV cargo transport. The driver's seat is unimaginable. However, the car can operate at speeds of up to 120 km / h and in unknown scenarios.

There are some reasons to believe that the condition of the use of the "car on demand" is very close to the perception of independent vehicles in the transport of goods required by companies in the industry: local language driver who wants to make long trips between cities is difficult to find long periods of absence and hours of work Regular versus low wages. Inverted truck drivers are the most common cause of severe accidents. Anchoring and maneuvering in tight delivery positions is always a difficult task for the driver.

Automation technology can be used before it is of great use. However, approval of all scenarios for heavy trucks will take some time, especially due to concerns about safety and required changes in the supply chain.

It is most likely to achieve a driver-free interstate pilot and free navigation between mid-term convergence points, for example between high-speed commuters or between good commercial areas. The likelihood of implementing this usage state can be increased by the following optimization concepts:

-Safety concerns can be mitigated by the absence of a driver at the level of referencing through separate entrances and exits of the Autonomous Vehicle Expressway, as this would minimize other vehicle encounters. Any path dedicated to autonomous vehicles can avoid these concerns implicitly. At the same time, such a dedicated path can be the starting point of the extended concept with alternative engine technology, if the line is equipped, for example, in the overhead connection line to provide electricity.

-Vehicle coupling will combine the concept of a driver available in a leading vehicle as a back-up with the expanded concept that vehicles run independently without drivers and take advantage of each concept. Vehicle class may be connected via the software system. The implementation of so-called high-speed e-towing rod will not only improve the use of road infrastructure, but also above all reduce fuel consumption and emissions due to low wind resistance.

Where multiple trucks or a convoy of lorries and passenger cars can safely drive up to 90 km / h with a gap of at least 4 meters. The systems were based on surveillance by radar sensors, stereo cameras and 3D maps and data are usually shared with other vehicles. Previous tests have always been conducted with a driver in the main vehicle or with or without drivers for extended availability in the following vehicles. There are already ideas under consideration for a car driving without a driver.

As a rule, these projects rely on proven current technology: adaptive cruise control systems integrated into chain production vehicles maintain gaps between vehicles. The data between the lead and the next vehicle is frequently connected via radio or infrared technology. The availability of measured fuel and the possibility of reducing CO 2 depending on the connection from the vehicle to the vehicle (V2V) (in "off-center" mode), the type and construction of the leading vehicle and the following vehicles, the gap and the speed as well as the roads and environmental conditions (surface, , Cliffs, Elevation). The difference was about 5% for the lead truck and 10-15% for the following passenger vehicles [18].

3.5 Full automation using the driver for the extended availability vehicle

The car takes full control when the position is approved for this situation. The driver is available at any time and can control the vehicle if necessary. In practice it is an extension of the intercity pilot in terms of approved positions and permitted speed and is very similar to independent driving.

This state of use is only enjoyable from an economic perspective if the companion driver can follow the value creation activities while driving. The next delivery can be set up or processed from an administrative point during the same drive. These vehicle concepts can also be conceptualized for use in commercial passenger traffic, for example for activities in the care of the elderly, the insurance industry, etc., involving documentation and administrative work.

The concept of "EmiL" for a partially independent delivery vehicle can be considered in 2011 as a kind of initial stage of development before full automation [19]. In this sense, a delivery person does not need to get in and out of the car on a continuous basis, but he can direct the car through the mobile phone to drive beside him at walking speed (follow-up function). For all unknown situations (such as merges and intersections), there is an additional DriveStick mode where you can drive up to 6 km / h. The use of local wireless communication uninterrupted signals that you are afraid to occur and can actually occur with GPS connections.

Select the research project to save approximately 40 minutes during a one-day delivery period. The typical risk of injury to the torsion or ankle is reduced when you get out of the car.

3.6 Connecting the valet service

The valet service refers to the state of use in which the autopilot independently travels in a vehicle to a pre-defined parking space. The concept assumes that it could have been achieved in the public domain at speeds of up to 30 km / h. One example could be independent driving from the driver's place of residence to a designated parking space. This state of use can not be envisaged in the context of the carriage of goods, since truck positions are rarely connected through the secondary road network.

Most likely, there is a scenario in which the autopilot controls the narrow inner city areas, the industrial delivery areas and the unplanned retail space for large trucks and the truck stops or anchors independently. This can prevent excessive damage to the car. The driver will be exempted from the stressful driving duties, which will be especially helpful in view of the driver's remaining responsibility for driving on long and exhausting highways. Connecting the service can also help drivers to comply with legal rest times if the "last mile" can be connected without their assistance.

Another possible case for delivery can be used to build sites. In major construction jobs, trucks are increasingly maintained in so-called waiting areas near the construction site. These processes could have been improved if drivers in large-scale concrete transmission procedures could focus on their operation and wait times were eliminated. The autopilot will drive between the waiting point and the construction site.

Legally, execution depends heavily on the distance between the waiting point and location, as well as the concrete scenario. Otherwise, implementation would seem more than a technical challenge. In particular, from the driver's point of view, who would be confronted with scenarios in which it is essentially alleged that he or she does not handle their working tool with the required skills

IV. CONCLUSION

Although the changes in the supply chain and the carriage of goods contain contradictory dimensions, they should be studied in detail. In terms of understanding, evaluation, classification, integration and the search for the best integrated dimensions to achieve the desired results in terms of time reduction and growing quality rates. Therefore, it is necessary to clarify the technological changes and challenges that will arise for the leadership function itself, which is the main pillar of the supply chain. The advantages and disadvantages of the use of motor vehicles should be considered in more detail than traditional vehicles, as well as integrated into the current work environment by automating the infrastructure and road networks to accommodate the next technology in the application, through the analysis of different job profiles in the business environment In detail and define the components of each job and the degree of importance and relative weight of each function of the general relative weight, as well as the current time and compare it with the standard time of the new system expected. Moreover, pay attention to the degree of independence that can be accepted by the industry with regard to necessity, cost and flexibility.

At the same time, there are also additional opportunities for innovative business models expected for the technological business, which have not yet been developed and evaluated. There are also imaginable alternative applications and solutions to challenges that can be overcome. Such as the supply and deployment of inland city sites ("city logistics"), characterized by conflicts, high costs, complexities in internal routes and adaptability to traditional urban traffic systems. Can lead to the free and efficient use of independent land transport vehicles, together with other components (such as the cargo lock system) to resolve time conflicts between freight and passenger traffic.

At the same time, opportunities and risks associated with greater automation of transport should be analyzed in greater detail through a cross-border macroeconomic perspective. The need for standardization and the potential for loss of low-level functions, including the legal aspects and dispute resolution mechanism that may arise when full automation is implemented taking into account environmental dimensions and resources

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