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METHODOLOGICAL SOLUTIONS OF INDIVIDUAL TRANSPORT PROCESSES THROUGH FORENSIC SCIENCES

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Abstract: The transport of individual cargoes, goods and equipment is often linked to multimodal forms of organisation, preparation and execution of transport, which is often linked to a number of factors that may affect individual operations, individual activities, and a number of factors that often lead to damage, disappearance or alteration of the characteristics of individual cargo, goods or equipment. The safety of individual forms of transport and the safety of transport of individual items, goods, cargo and equipment is thus linked to the form of transport (ship, wagon, aircraft, truck), the form of infrastructure (water, rail, air, road), procedures and forms of loading and handling. Often, however, the procedures are different, technologically sophisticated or up-to-date, but may cause a number of undesirable inconveniences. The subject of research is minerals or granulates imported by the customer, in the form of dry quartzite sand and for the production of quality glass for moulding and modelling, by means of multimodal transport from abroad. After many years of business success and satisfied mutual cooperation between the parties, the process has been broken in the given circumstances, causing a series of inconveniences that have consequently been manifested in terms of business, cash flow and, above all, business confidence. In order to correct irregularities, to detect errors or undesirable behaviours by others, the overall procedures had to be checked, the causes identified and an appropriate remedy given. The complexity of the individual procedures was so precise and in the order of questions that it was impossible to find an answer through the records and the accompanying transport documentation, how the granulates were replaced and, consequently, the causes of the damage suffered. Methodological solutions of individual processes had to be found through forensic sciences, which after proper processing and verification showed real causes and deviations in logistical activity. The aim was to determine whether wrong practices had been committed in the context of the service activity, or whether it involved the deliberate disposal of granulates as raw materials or building materials, which could also form the basis for legal proceedings through the validations obtained.

Keywords: logistics, processes, forensics, working methods, management.

METODOLOŠKE REŠITVE ZA POSAMEZNE TRANSPORTNE PROCESSE S POMOČJO FORENZIČNE ZNANOSTI

Povzetek: Prevoz posameznega tovora, blaga in opreme je pogosto vezan na multimodalne oblike organizacije, pripravo in izvedbo prevoza, kar je pogosto povezano s številnimi dejavniki, ki lahko vplivajo na posamezne operacije, posamezne dejavnosti, ter številnimi dejavniki, ki velikokrat vodijo v poškodovanje, izginotje ali spremembo lastnosti posameznega tovora, blaga ali opreme. Varnost posameznih oblik prevoza in varnost prevoza posameznih predmetov, blaga, tovora in opreme je tako povezana z obliko prevoza (ladja, vagon, letalo, tovornjak), obliko infrastrukture (vodna, železniška, zračna, cestna), postopki in načini natovarjanja in ravnjanja s tovorom. Pogosto so ti postopki drugačni, tehnološko dovršeni ali posodobljeni, ki pa vseeno lahko privedejo do številnih nevarnosti. Predmet raziskave so minerali ali granulati, ki jih uvaža naročnik z multimodalnim transportom iz tujine, v obliki suhega kvarcitnega peska in za proizvodnjo kakovostnega stekla za oblikovanje in modeliranje. Po dolgoletnem poslovnem uspehu in zadovoljnem vzajemnem sodelovanju obeh strani, je bil proces v danih okoliščinah prekinjen, kar je povzročilo vrsto nevarnosti, ki so se posledično pokazale na področju poslovanja, denarnih tokov in predvsem poslovnega zaupanja. Da bi odpravili nepravilnosti, odkrili napake ali nezaželeno vedenje, je bilo treba preveriti celotne postopke, ugotoviti vzroke in podati ustrezno rešitev. Zaradi kompleksnosti posameznih postopkov ni bilo mogoče najti odgovora zgolj iz evidence in spremne dokumentacije. Da bi našli odgovore na vprašanje, kako je prišlo do zamenjave granulotov in posledično do škode, ter da bi našli metodološke rešitve posameznih procesov smo se poslužili forenzičnih ved. Te so po ustreznih obdelavi in preverjanju podatkov pokazale resnične vzroke in odstopanja v logistični dejavnosti. Cilj je bil ugotoviti, ali je do tega prišlo zaradi slabih praks ali gre za namerno odlaganje granulotov kot surovin ali gradbenega materiala, kar bi lahko bilo tudi podlaga za sodne postopke.

Ključne besede: logistika, procesi, forenzika, metode dela, menedžment.

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Introduction

Through its development and creation, logistics has created a field of service activity that enables the organisation, preparation and execution of transport of various goods, materials, things or capital. In identifying logistics, we find that it is a service activity. Without it, it is not possible to organise industrial production, economic or non-economic activity. Its individual processes represent complex procedures, practices and activities that require careful management, monitoring and recording of individual tasks that are identified through the preparation of documentation, the appropriate selection of individual operators for loading or stacking, the selection of the appropriate transport operator, depending on the form of the means of transport and the form of infrastructure used. The specificity of service activities or logistics is also in its small tasks, which are reflected in all the details of the organisation of all tasks and responsibilities that are present in each work organisation. When we are talking about the logistical process of transport, we must pay particular attention to the systems of logistics systems (Zelenika, 2006) that enable transport to be organised, properly prepared and carried out properly, according to the requirements of the subscriber, the payer or other transport subscriber. When describing conventional transports, we find a much lower risk than in describing international multimodal transports. These require a broader knowledge of logistics systems management (Zelenika, 2008). They must be properly linked, subdued, merged and allowed to carry out all the required logistics tasks in a specific case, whether grouped or individually, depending on the concept of the organisation.

The organisation of multimodal transports presents demanding procedures and preparations that require knowledge of multimodal transport systems, which need to be studied, mastered, systematically prepared and then organised. It is a web, interconnected system so interconnected that it is impossible to separate or skip individual processes, as they include a series of scholastic and dynamic systems that are linked to the organisation and course of multimodal transports. Thus, we find that the identification of logistical systems directs us to use information technology for innovative inter-organisational integration (Gričar, 2009), where we actually recognise the capabilities of system integration and direction of different transport flows. Thus we come to the need to recognise the economics of transport systems (Zelenika, 2010), where we recognise, through economic aspects, the foundations of transport and its numerous connections with industry, production, purchasing, financial flows, economics and beyond. The individual rights and legal obligations of the parties in a multimodal and interconnected system, which is full of the obligations and responsibilities of individual parties involved in these transactions, can't be disregarded in any way. In the detailed part, we come to direct legal transactions, which are very narrowly linked to the rights and obligations of individual parties and forms of mutual commitment, which is usually reflected in concluded mutual agreements (Jankovič, Murtič, 2019). It is also impossible to talk about multimodal organisation of transport without mentioning the models of organizational integration. Models are present throughout the organizational integration of many economic factors. Models are economical and commercial tied to participants in legal transactions. They are different in content and form (Murtič, jankovič, 2019), but they complement and facilitate travel, transport and all other forms of service activities that are necessary for performing various tasks in the field of logistics and transport. These are trends in supply chain management in space and time, trends in the supply of industrial or other production, or even supply to the population (Štor, 2019), without neglecting fixed supplies, organised and established forms of transport, professional and software coordination between them and the search for new and more modern solutions. Throughout the development of multimodal transports, the exchange of goods and services is aimed at finding new paradigms of logistics management in the logistics industry and beyond (Franko, Murtič, 2019). The increased cooperation of logistical information and logistics management systems through which a number of transactions are realised and the data chains required for individual and common logistics services systems are confirmed (Medeot, 2019). The technological procedures of input materials, through individual service processes, through logistics and its processes are certainly also interesting, as they are precisely crucial how and how individual operations will be carried out (Franko, 2020), how the purchase, transport and reception of materials will be carried out at the delivery point or point of reception. These are small and important service activities that enable loading (loading), monitoring and stacking of different types of cargo, with technology and technological processes in support.

Even in a specific research case, the transport of individual cargoes, goods and equipment is linked to modern multimodal forms of organisation, preparation and execution of transport and to a number of factors that may or have influenced individual procedures and activities. There are a lot of factors that cause damage, disappearance or change in the characteristics of individual cargoes, goods or equipment. For this reason, we are based on the theory that the safety of individual forms of transport and transport of individual items, goods, cargo and also equipment related to the form of transport, the form of infrastructure, procedures and forms of individual services (loading, handling). Often, however, the procedures are different, technically and technologically sophisticated or up-to-date, but it is precisely because of this difference that they can lead to a range of undesirable effects as well as consequences. How to identify, identify, identify and manage individual causes depends on a number of theories, knowledge and competence of individual stakeholders. However, there are cases where forensics must be used to detect, correct errors or introduce new systems. Forensic provides concrete evidence and arguments for detecting, identifying and improving individual systems, and often provides the basis for demonstrating those measures, procedures, or activities that have not been agreed in the business or are harmful to management. Criminalistics studies and discovers the most appropriate methods and means of technical and natural sciences for practical use in criminal investigation (Vidic, 1973). It covers the area of the scene of a crime or event, search, insurance, study of traces and objects of the crime (Maver, 1997). The criminalistics tour is unique and its role is very important, since in order to successfully crime detection, investigators have to carry out a high-quality viewing of the scene (Crispino, 2008). The tour is the starting point of the successful use of

material evidence given by the forensic laboratory and criminalistics investigators (Chisum et al, 2007; James et al, 2009). Forensics is an upgrade of criminalistics, and is a common name for knowledge from various disciplines that contribute to the disclosure of crimes. A science deals with the investigation of material traces in all legal cases for the purpose of identification, individualisation and evaluation of evidentiary value.

Research field

The research field can be define through the need to organise multimodal transport of raw materials for production needs and through a service activity, which is often the key to resolving individual ambiguities arising from transport and processes that are narrowly linked to the transport itself. The subject of research is the loading and transport operations of cargo (loading, handling, stacking), means of transport and forms of infrastructure that enable transport and logistical services in the first place. We have studied the route, transport and individual logistical processes related to minerals or granulates that are imported by the customer, in the form of dry quartzite sand, and for the production of quality glass for the design and modelling of a known customer, with the help of multimodal transport. They are systemically sophisticated multimodal forms of transport and logistics services, which are highly synchronised or coordinated and enable the current supply of quality decorative or expensive glass production, which is built into hotels and other higher-end facilities. After many years of business success and satisfied mutual cooperation between the parties, the process has been broken in the given circumstances, which has led to a series of inconveniences that have subsequently emerged in terms of business, cash flow and, above all, in business confidence between customers. The difficulty of identifying the causes was sought on all business processes, as part of logistics processes, transport and especially in many activities related to transport. The complexity of deciphering the case required the study of all systems from the mineral genera to the port abroad, loading on board, transporting, stacking in port and transporting inland Slovenia to the mineral buyer. In order to correct irregularities, to detect errors or undesirable behaviour by others, the entire procedures had to be checked, the causes identified and an appropriate solution to remedy the adverse event, and to ensure that there was no recurrence in the future, which could be systemically redirected to another port. The complexity of the individual procedures thus required, accurately and in a sequence of numerous unknowns (questions) that made it impossible, to obtain an answer through the records and accompanying transport documentation, which would explain how the replacement or loss of granulates and consequently the causes of the damage suffered. Methodological solutions of individual processes had to be found through forensic sciences, which only after proper processing and verification showed actual causes and deviations in logistical activity. The ultimate aim was to determine whether incorrect procedures were committed in the context of the service activity or whether it was intentional to dispose of granulates as raw material or building materials, which could also serve as a basis for criminal legal proceedings through the validations obtained.

Due to the scope of the documentation, the systemic functioning of the logistical information and logistical management system and the numerous factors involved in the interconnection systems in the execution of the individual phases of the transaction, it was necessary to verify any detail that would point to concrete data to solve the problems identified. We checked a number of previous transactions, reviewed the supporting documentation, transactions and concluded contracts, which were the starting point for verifying the changes that have occurred. Following the systematic selection of changes in logistics or production systems, we discussed other theories that could give us a new paradigm of change management (Bukovec, 2009). Through the theory of knowledge and change, we have tried to make a discovery that would point to something new that could refute black scenarios, the deliberate or accidental functioning of humans in a system or system in the system. The purpose of the research was to give credible views on the actual state of the changes resulting from the development of multimodal transport systems using the theory of organizational and business sciences, taking into account internationally comparable relevant facts in a professional and reasoned way. Key objectives were to identify the basic concepts of theoretical starting points of research, to analyse the transport processes to date and to find new insights that could affect changes, to test individual procedures, to formulate a response or solution, to confirm or refute the thesis raised and to indicate possible improvements in the system of operation. For this reason, we had to study a number of transport systems and apply the theory of science that could help us to identify individual systems solutions and their interconnections.

Hypothesis

In order to clarify and find appropriate solutions, it was necessary to ask a number of questions first and only to confirm or refute a key hypothesis that would scientifically confirm the reality and highlight the event in the light of the search for an adequate truth. Many data intertwined both statistically and mathematically, creating different algorithms or calculations and data that could greatly expand or narrow the study. We were familiar with the models of transport organisation, so we divided them into the form and organisation of multimodal transport according to the eastern theory of the Toyota Company in Japan, which is a model typical of all transports from the southeast and east of our planet. We also compared the western model of the Ford Company in the United States and compared the two models to the standard model that was designed informally in Europe and other continents. The Toyota Company is based on outsourcing in its entirety, meaning that the industry or consignor is not engaged in transport, because it is entirely left to transport organisations, natural or legal persons with this basic activity (<https://sl.wikipedia.org/wiki/ToyotaToyota>). Ford Company is organised in

a completely different way and ensures consistent control of the shipment, transport and sale of their products at all times (Ford Motor Company). The difference is obvious and recognisable, which cannot be said for the European or general model of multimodal transport organisation. It is not possible to determine the model here, nor to determine the form of the organisation of the transport, since all transactions take place according to the agreement of the parties. Transactions may involve several parties and organisations, or several transactions may be combined in a single joint operation. Their agreements are different, they may be known or unknown, they only have to take into account the basics of the contractual relationship (Jankovič, Murtič, 2019), which gives them legal certainty in their dealings. We have therefore directed our decision to determine hypotheses to the search for a model and form of transport that would be appropriate in concrete research. A concrete example can be mapped in all model cases in the same way and in all cases the cargo would arrive at the port. There is no need to determine ship navigation procedures, organisation of work, business entered into, insurance and more generally. We have therefore sought answers to certain questions that form the basis of our answers and formulate the hypothesis, namely:

- in what condition the cargo (liquid, hard state, granulate, dry or wet) was,
- when the ship arrived in port and when the ship was discharged,
- what procedures for lifting, lowering, transshipping the goods have been stored,
- by what tools the goods were moved between the ship and the warehouse and between storage and subsequent transport; and
- who has taken over the port and who has passed the goods on.

In view of the questions raised and the logistical management systems in the port, we came up with the target hypothesis “The transshipment procedures of goods were relatively different, which may have affected the mishandling of cargo”. We had to prove or refute the hypothesis, for which we used modern systems and methodological solutions of individual processes through forensic sciences. The procedures have proved useful, leading to some new findings in service activities, in transport and in procedures related to the operation of systems within the port, logistic zones, marshalling yards or air terminals. The port has used our findings to technical and technological modernise systems and to introduce intelligent systems of inspection, reception, take-over, storage and transmission of goods, namely goods that prove to require specific systems of service activity. At this stage, it was not possible to determine the systemic error, it was not possible to determine the object or subject of the resulting cause, which is why we had carefully planned and carried out the investigation.

Baselines of the survey

In the specific case, SILENSTE d.o.o., Slovenia, from the Democratic Republic of Congo in Africa, in cooperation with the company “KvarcGold d.o.o.”, imported the quality granulate quartzite for the manufacture of figured shapes of glass for a known European customer, which was built into hotels, prestigious houses and higher priced houses. The contractual business relationship between the company KvarcGold in the Democratic Republic of Congo and SILENSTE in Slovenia has been uninterrupted and continuous for 30 years and a reasonable business trust was built between them, which was reflected in the quality of the ore or granulates of quartzite, regular payments and mutual exchange of supply and demand data. The shipping company Bubaya has scheduled transports from Congo to central and southern parts of Europe and stops on its way in several ports where cargoes are transported or rented. The documentation showed that the ship had the last point of travel in the port of Trieste, Italy, before stopping at Port, where loading and loading of various cargoes was carried out. Normally, the ship carried out all necessary work and logistical work in the harbour. In a case where we were checking for granular loss, the ship was moved to the second pier in the port. This is due to the technology and form of transported granulates (which is not common) and the presence of connections for the transshipment of goods by spraying or air transshipping for certain cereals. We wrote this information down as a starting point for verification, but we were not sure that this could be the main way out to determine the changes and the final cause.

By reviewing the basic data of transport activities (multimodal transport), we received concrete data as a starting point of research, which helped us to identify all service activities and supporting documentation related to the transported mineral or quartzite. Several transports of the same ore or quartzite show that there were no deficiencies, nor was the ore or other cargo lost or disappeared, nor was it delivered to the natural or legal person who did not carry out the order. Of course, at this stage, we have not yet dealt with the transshipment procedures themselves, because we have taken the usual forms of transshipment and storage of goods such as theirs in port. At this stage of the survey, we looked at the arrivals of ships, documentation of orders, shipments, transport and entry into the port itself. Since forms of transport, timetables, information and management systems in the port were covered and demonstrated the smooth and smooth entry of the ship and the ongoing operation of logistical services in the port, we continued our research in the port itself and looked for the reasons for the replacement or disposal of minerals or granulates of quartzite.

Survey methodology

The survey was defined in terms of the basis and completion of the model of transport and logistical services in the port itself and the search for a useful model for comparing successive transports of the same type. It required the use of innovative, interdisciplinary and port-based approaches that would not interfere with work processes and would deliver key research results. We had to study extensive literature and materials developed in various legislation (Zakon o plovidbi po celinskih vodah, 2002) and a number of regulations governing the operation of the Port of Koper, port security, port management policy and many other regulations (port security, etc.), in order to obtain at least basic data to highlight the research case). It was necessary to examine the extensive technical literature and the findings of previous identified deficiencies that guided the management of the port in order to improve the system of operation. In doing so, we relied on the basic characteristics of scientific discourse and were satisfied not only by collecting and verifying existing knowledge, but also by analysing individual findings, comparing and seeking suitable solutions that would direct us to a specific case. We compared the data and knowledge with each other in a quality combination of many methods or models of work in the port, looking for any little thing that could tell us what actually happened. In doing so, we relied scientifically on inductive and deductive approaches and processes of analysis and synthesis, finally applying the generally recognised processes of service activity based on the hierarchy of individual tasks, taking into account all possible combinations and variations of solving a particular case. We were based on successive arrivals of ships into the port, their discharge and recharging, the structure of individual tasks or service actions, where we searched for procedures that could be different or wrong. We have also taken into account the fact of error, for science teaches us that man is erroneous. There were too many intelligent autonomous systems that operate independently and are infallible in processes and processes of logistical services, so we had to study all possible combinations, compare them and search for data that are identical, and data that are not the same and which are not recorded or recorded otherwise. In both cases, the analysis did not give adequate results, so we decided on methodological solutions of individual processes through forensic sciences, with which we tried to obtain data in the micro area, which would clarify the case and help us determine the causes of the situation. In this area, we have re-examined transport industry systems, as described by Zelenika (2010), where it illustrates the implementation of the modal of sustainable development of the transport industry in micro-transport systems (the links can be found in his other written sciences, which we have already mentioned). In methodological terms, wider knowledge and knowledge of research techniques and methods had to be used for thinking and research. Nevertheless, it was necessary to search for micro traces that formed the basis for forensic fact-finding and could be the basis for the confirmation or rebuttal of the hypothesis raised.

Course of research

Already in the introductory part we found that the transport of individual loads, goods and equipment is often linked to multimodal forms of organisation, preparation and execution of transport. These procedures are often linked to a number of factors that may or often affect individual operations or activities, and may also result in a number of factors that may cause damage, disappearance or alteration of the characteristics of individual cargo, goods or equipment. We also found that the safety of individual forms of transport and the security of transport of individual items, goods, cargo and equipment related to the form of transport, the form of infrastructure, the form of loading, handling, and often the processes are technologically different, modernised, but can cause a number of undesirable inconveniences. That is why we first extended our research to the full range of all services and tried to reach a key research problem through individual elimination of proper procedures and processes. At the forefront was the subject of research into the disappearance of minerals or granulates, imported by the company SILENSTE d.o.o., in the form of dry quartzite sand, for the production of quality glass for design and modelling, from the Democratic Republic of Congo through the supply company KVARCGOLD, with the help of multimodal transport. In order to correct irregularities and to detect errors or undesirable behaviour of natural or legal persons, we have undertaken to verify all procedures and operations in the order of multimodal transport and to look for the causes of the disappearance or erroneous replacement of granulates.

The purchase and transport documentation showed that SILENSTE ordered 30,000 kilograms/litre from the production company KVARCGOLD in September 2019 (documentation according to various standards of granulate quartzite measures by kilograms or through litters). The order was appropriate to previous ones, giving SILENSTE to import the same quantity of quartzite twice a year, which it used for quality glass products for a known customer. A broader review of international regulations shows that the business and import of this type of mineral is acceptable and must be accompanied by appropriate documentation confirming this. From the documents examined, we found that the order and the connections between the two companies were carried out in standard form, the glass is the order, the transports were arranged and the goods loaded onto the ship Babaya, which took over the goods at the port of Muanda, as shown in the documents examined. At SILENSTE, we compare several identical orders and supporting documents that guided us to continue the research. After the ship entered our port, the cargo was first carried out into the warehouse and after three days on a freight vehicle that led to the quartzite in the direction of production or to the headquarters of the company. All operations in port shall be covered by documentation necessary at the time of collection, storage and delivery of the goods. We also check the port documentation and takeover of the goods for SILENSTE, and we find that the procedures have been carried out in exactly the same way as in all previous cases. The port shows through documentation that the quartzite has arrived at the port, that it has been stored and

then transferred to the transport organisation that took the goods to the transferee. The carrier's documentation also explains that it has taken over the goods and led them to the acquirer or warehouse of the company SILENSTE. Through the reviewed documentation, the verification of individual procedures, the analysis of data and the use of numerous scientific methods, we came to the knowledge that all procedures ran smoothly and should have completed the business in the same way as they did in all previous transactions. SILENSTE's representatives show that no quartzite granulates were received, which resulted in significant material damage due to the fact that they could not produce the ordered products and all the documentation showed that the granulate had been delivered to the yard of the company. We checked the procedures of the service activity in the company itself, where we found that there are more employees at the takeover of the materials, which may result in the worker taking over the goods inspecting the documentation and not checking the contents of the goods. Through the search for appropriate answers, we found that the granulates were in larger crates, which they carry on trolleys and thus manipulated in the production process. In preparation for production, the workers found that there were no quartzite in the crates, so the crates were taken to another warehouse and needed a quartzite still in stock. It was only after a week of production that they realised that they did not have the raw material and that production was stopped as a result. The examination of the procedures for taking over and storing goods quickly gave us the answer that there has been a change of materials and that the quartzite has probably been taken elsewhere and another material which is not suitable for glass manufacturing operations has been brought to them. In this part of the survey, it was necessary to ask a few questions, through which answers could be given to the thesis and to determine the reality. When asked what condition the cargo was (liquid, hard, granulate, dry or wet), we got that it was a dry quartzite in the form of fine minerals, which requires the material to be stored in advance in polyvinyl or other bags, but if it is in completely bulk, it must be specially protected. We asked the question at the port when the ship arrived and when the ship was discharged, which was said to us on the same day because it continued to another port. We have examined the management of transport networks through conventional systems and checked material, financial and equity flows, as shown in Figure 1 below.

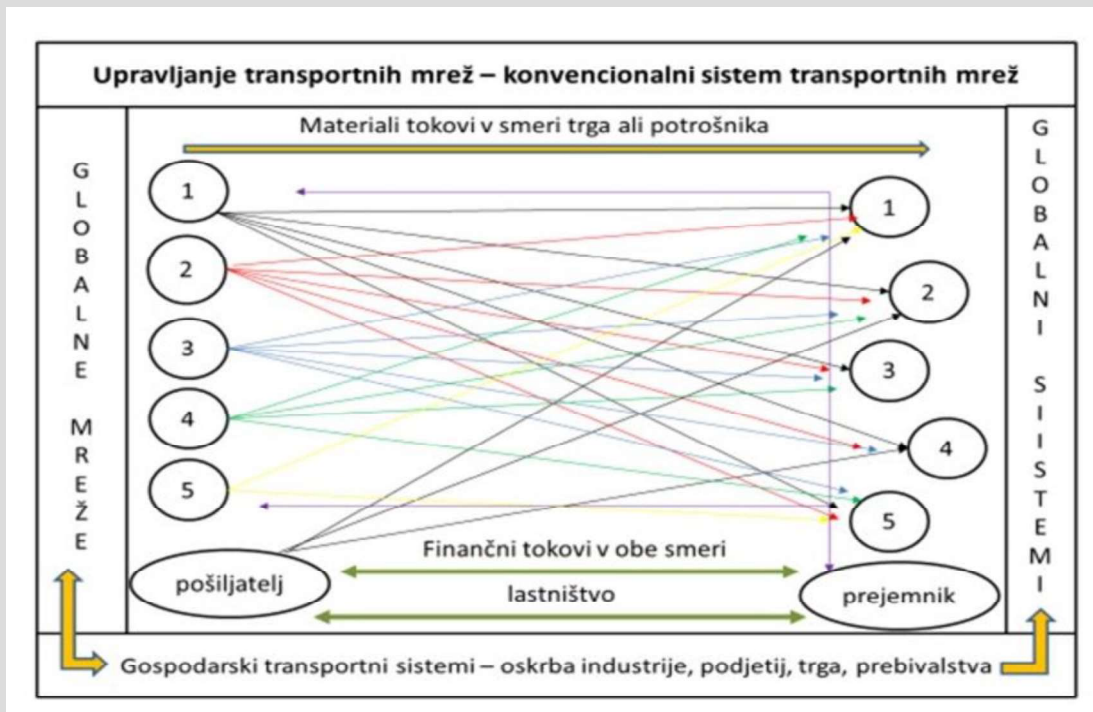


Figure 1. The management of transport networks through conventional systems and checked material, financial and equity flows (According to the contents of the survey, authors 2021)

Further, we asked what procedures for lifting, lowering, transhipping the goods were stored, we were told that most bulk cargo was empty with different tools, showing us different forms of loading or composing from the ship or on board. We did not have an answer yet, so we continued with questions about the tools with which goods were moved between the ship and the warehouse and between the warehouse and further transport. They say that most goods are immediately loaded on railway wagons, freight vehicles, and some are transported by their own transports to dry warehouses in the port. When questioning who took over the goods and who handed the goods forward, they give us all the documentation that explains that the goods were accepted and delivered into further transport. In all procedures and issues, despite agreements being reached, the matter gets complicated and stops. The research is redirected to the verification of individual logistical services in the port and we check the handling and procedures of logistics in dry granules. It is explained that in cases where the transport process involves grain (wheat, soybean, corn, oats, etc.), the transshipment is carried out by spraying through pipe systems to the warehouse, which again continues to the same way to the transport vehicle that transports the goods to the final customer. We focus the survey in more detail on the verification of this system and carry out a review of the logs of

the work of the port on the Bubaya ship on the day of arrival. The management of multimodal systems is much more complex but manageable, as we have seen through verification of individual services within the port and through documents showing the route and course of the Bubaya transport. The documents showed all the interconnections of multimodal transport, the connections of several types of transport vehicles, several types of infrastructure, and the interconnections of legal and natural persons involved in the transport process, as shown in Figure 2 below.

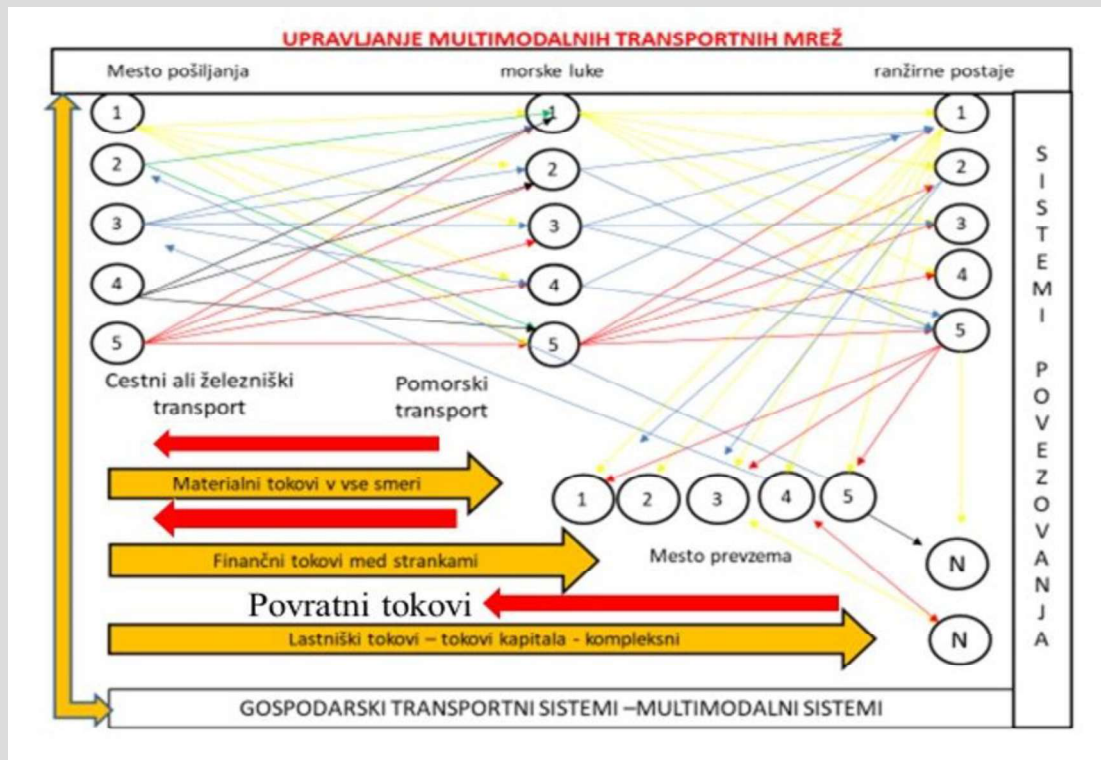


Figure 2. The management of multimodal systems (According to the contents of the survey, authors 2021)

It is noted that the ship was exceptionally moved to a harbour where the flow of petroleum, gas or other products is carried out. From the diary, we find information that explains that there is an injection system for grains and light granulates up to the derivative streaming system. The ship's movement was carried out to tranship with spraying systems, but there was no precise record of what was actually flown or blown through the system, postponed. We stopped a number of questions and unknowns that opened up new possibilities and gave us the basis for formulating the hypothesis of our research 'The transshipment procedures of goods were relatively different, which could have affected the mishandling of cargo'. The complexity of the individual procedures was so precise and in the order of questions that it was impossible to find an answer through the records and the accompanying transport documentation, how the granulates were replaced and, consequently, the causes of the damage suffered. We decided that methodological solutions of individual processes should be included in the research through forensic sciences, which, after proper processing of data, transported cargo, pumping or stacking of goods, will provide the results of what happened in seriousness, for which we had the opportunity to verify logistical procedures and find actual causes and deviations in logistic activities. The aim was to determine whether wrong procedures were committed in the context of the service activity, or whether it was the deliberate alienation of granulates as raw materials or building materials, which could also be the basis for legal proceedings through the certificates obtained.

Using methods of collection, checking, sampling and analysis of individual samples found in the spraying system, forensic experts have concluded that there are several different granulates in the system. The most present is the granulate of red-blue reflections, which are commonly used to regulate stone floors in residential houses and high-end business premises, and granulates of various expensive materials were present. When sampling the samples found, the pod made a scale of various materials, including 21 samples of different raw materials. The most outstanding were the samples of quartzite that we missed and a sample of unknown material, which was found to be semi-precious stones imported from the countries of the east (China, Armenia, Pakistan...). After the prepared rock and after the concentration of the samples obtained, the profession, using forensic methods, prepared new questions to which answers had to be sought. Through the inspection of the operation of the port and logs of the records of the services provided (some are still in writing and most in electronic records) we found that goods were brought through the port, for the needs of the company ČEDABA d.o.o. The goods were in the same way as a quartzite placed in a warehouse and then a cargo vehicle a tanker carrying the goods forward.

Due to the recognition of methods of forensic research, we presented examples of porous (e.g. paper) and non-porous surfaces (e.g. plastic bags) where we tried to find answers or at least directions that would help us through theory. Through numerous research, we

knew that it was best to search for fingerprints and DNA on paper or plastic bags. Through a comparison of the fingerprints, we got the answers that human skin has many functions (Fajdiga, 1998). Where the acidic and oily ingredients give the skin protective abilities. It consists of three parts: The upper part of the skin epidermis, the middle part of the skin dermis, corium or cutis, and deep part of the skin – hypodermis. Sweats are multicellular, tubular, exocrine glands. Their secretion is sweat or sudor. Depending on the type of elimination, they are divided into apocrine and apocrine. In addition to water, gland secretions have inorganic components (chlorides, metal ions, sulphates, bicarbonates, ammonia, iron) and organic components (amino acids, proteins, urea, urea, uric acid, sugars, creatinine, choline, carbohydrates, sterols) (Kent, 2000). The surface of the skin on the fingers, knuckles, hands and feet is not smooth, contains ridges, grooves, bumps, indentations and openings. A skin drawing or skin relief typical of each individual shapes all of this. Skin relief does not change during life. In addition to the surface on which the trace was formed, the skin plays a key role in the formation of finger marks. For finger mark recovery is carried out using four methods: optical, physical, physicochemical and chemical (Lee et. al., 2001). In the following, we used an optical or non-destructive method. It does not damage traces, so it is used before other methods of recovery. Strong light combined with different optical filters (e.g. lamps, forensic light sources, lasers) improves the contrast between the substrate and the trace and thus the visibility of the trace. We also used physical methods that are most commonly used during fingerprinting and challenging shorter. The application of various dactyloscopic powders (e.g. aluminium, magnetic, Swedish black) and aerosols (e.g. SPR) results in staining of invisible finger traces on the test material. Since in a specific case it was necessary to examine all options and exclude all data that would only hinder the search for solutions, we also used a physico-chemical method using iodine steam and cyanoacrylate (CA). Otherwise, it is a laboratory test and an indoor procedure where temperature and humidity are controlled. Finally, chemical methods are challenging soil traces on porous surfaces or for imprinted traces (e.g. silver nitrate, ninhydrin, DFO, RTX), which are present in port due to wear and tear of individual systems.

There was a possibility of abuse in the data recording system of the unrequited person, so we also carried out searches for finger marks on paper surfaces, which are porous surfaces and can be used ninhydrin or DFO methods. Ninhydrin (2, 2-dihydroxy-1,3-dione) is a crystalline powder soluble in water and polar solvents. We have a number of records that show that it clings to high temperatures and turns dark red and decays, so we have to keep it in a dark and cool place (Champod et al, 2004). It reacts with primary and secun-dark amines (amino acids, proteins, peptides) found in the soil trace. The results of the challenge depend on the conditions under which the reaction occurs (relative air humidity, temperature, and pH). DFO (1, 8-diazafluorene-9-one) is a fluorogenic reagent to provoke traces on porous surfaces. The reagent reacts predominantly with amino acids (Kent, 2000) found in the soil trace. The induced traces are pale purple and very poorly visible. For example, a forensic light source shall be used to examine the traces. Recovered marks are fluoresced in yellow at a wavelength between 430 nm and 580 nm. Due to numerous smooth surfaces and plastic packaging, a kin-like bag, we continued to search for marks on these surfaces using cyanoacrylate ester (alkyl-2-cyanoacrylate ester), which is a colourless reagent (Brown, 2021). There's a liquid in a manometer form. It has a high polymerisation capability. When heated, CA starts to evaporate. The resulting steam reacts with amino acids, fatty acids, sweat proteins and moisture present in the air (Wurmb et al., 2001). A white polymer of polycyanoacrylate is formed. CA vapours react with certain components of excreta of eccrine and holocrine glands polymerise on traces of papillary lines and form a white polymer. Sometimes the contrast between the substrate and the induced traces should be increased by dyes. Fluorescent dyes are used, e.g. BY40, which fluoresce at a given wavelength using e.g. a forensic light source. Of course, it would be best to obtain DNA (deoxyribonucleic acid) of the perpetrator or person responsible for detecting intent or gross negligence in the system of action. This method now plays a very important role in forensic investigations, where a long molecule consists of two helix chains. Forensics aims to compare controversial biological traces (e.g. saliva, blood) with suspicion (9). Biological traces can also be found on paper and plastic bags. To protect biological traces on different surfaces, standardised accessories for the removal and storage of biological traces are used. A sample of traces is taken with a sterilised wand, inserted into the insurance packaging and sealed. Further forensic tests are being conducted in the laboratory.

In order to confirm or refute the theory of the methodology of forensic research, we checked the documentation of the company ČEDABA in cooperation with the representatives of the port, but the first data indicated that there were no errors recorded in transit procedures through the port. Nevertheless, we decided to call the company, from which they replied in writing that they did not have any errors in their business operations and records, as their delivery of their shipments was smooth. Once again, we were in the diversion of the logistic services system in Port, for which we had to do the next variable and add the most related sample to the verification and evaluation. We repeated the procedure with seven samples and received a response from all subscribers that there was nothing wrong with their shipments. The forensic group did not give up and continued their search, and after the thirteenth sample we received a message from the Czech company ČEDABA, in which they apologised that there had been a mistake and that no changes were found at the first check, and in the detailed examination they found that white granulates were also white granulate, similar to glass, for which they were analysed and found that it was a raw material quartzite, from which the quality of the glass can be produced. We asked for samples to be sent to us in a letter through the express mail and by plane, which arrived within two days. The samples obtained were identical to the quartzite samples allegedly supplied by SILENSTE from the Congo.

With leadership and management in Port, we convened a meeting at which we examined all systems and tried to find out how a system error of the replacement of granulates or transported material could occur. We were aware that this was a human mistake, but we did not look for guilt or negligence, looking for answers that would make it possible to improve the systems of operation in the port.

Discussion

Through the various phases of logistical services carried out in the process of multimodal transport of minerals or minerals from the Democratic Republic of Congo, through individual services in the port, on the basis of the assumption that the handling of goods was relatively different from the usual, through the handling of goods, in cooperation with representatives of the port, representatives of the company SILENSTE and via a video link with representatives of the company KVARCGOLD in Congo and the ČEDA company, the discussion was opened. We have noted our findings of the process of transporting and organising the acquisition and loading of quartzite in the port of Muanda, transporting by sea to the port, where we have examined in detail the procedures for entering and discharging and handling cargoes. In the debate, we found that in the specific case there was an exception, namely bulk goods in the form of fine granulates, quartzite minerals used by SILENSTE to produce quality glass. Throughout all phases of the research, we have examined in detail all types of means of transport and all forms of infrastructure and, on the basis of scientific theories and findings, we searched for answers to the questions where the mistake of replacing granulates was made. We were looking for an answer if the error was made intentionally or if there was a technical or technological error in the system that carried out the procedures differently from what was foreseen. We were looking for errors in mineral records on the receipt forms in the port depot, looking for answers to the ship's move to another port, which was not common for such ships, we looked for answers related to systems for blowing and storing raw materials or materials through pipe systems.

The survey showed that materials were very dry, have a certain gravity, but their composition is such that it is impossible, or at least more difficult, to overload them with tools and loading systems for lifting, descending and transporting them, so it was decided by the management of the ship unloading sector that due to the strong wind in the port, which would carry the granulates in the form of desert sand across the port space, the transshipment could be carried out by blowing the ship to be stored in a dry warehouse. All the documentation showed the proper handling of granulates, and the stored goods were properly handed over to the transport organisation that took the goods to the commercial company SILENSTE, following the same injection procedure. In the same way, the port carried out a number of tasks related to similar granulates, without recording the loss, replacement or disappearance of raw materials. Following the announcement by the company SILENSTE that they had acquired granulates that were not identical to those ordered (supplied to be exchanged), we carried out a survey and realised that using scientific methods and appropriate technology it was necessary to take samples of granulates and investigate them, and to carry out a comparison and analysis and to carry out complex checks that showed that there was indeed a systemic failure in the system of storage and delivery of goods, which was linked to the technology of the port's logistic services or systems. The discussion confirmed that port officials, through verification of the performance of blow-up systems, had discovered that the error was in a switch system designed to detect with special sensors and identifiable sensors, which recognise granules by weight and size and direct the material to dedicated spaces. The system's sensory defect caused the system of granulate quartzite, which was the same size as ČEDABA's granules, to direct to other storage. This was supposed to be a case that occurred once in a few decades and in a few thousand cases, which is negligible given the success of the operation and the examples of good practice in the port. The research revealed that the materials were very dry, because they had, through science and the theory of individual procedures and processes and with the help of forensics, that the failure in the system was actually in the port systems, so the management of the port took full responsibility for the change and agreed with the insurance company to cover the costs of replacing granulates between SILENSTE and ČEDABA through systems. It turned out that granulates could be exchanged between ČEDABA and SILENSTE in kind because they were properly stored in quantity and quality and were awaiting the resolution of the research case. The final damage suffered was only in transport carried out between the companies involved, which was covered by the port insurance policy. The case was recorded as an example of good practice, which could be used in other ports.

Conclusion

The survey has shown that in logistics and logistics services or in service activities, cases may arise that require scientific research. The replacement of granulates at the first stage of detection may have meant a serious loss for SILENSTE, since the order of raw materials was linked to a specific order of products for a known customer. If the raw materials were not found, the order would have been cancelled and serious economic damage would be done.

Throughout the research we realised that this was a new paradigm of system management in logistics and logistics processes, so we sought building blocks or new methods of research work in holistic approaches, which in modern industry 4.0 and the system development of industry 5.0 empirically demonstrate with success and innovation, which is reflected in modern intelligent logistics systems that belong to the modern period of industrial development. In addition to numerous legislation, regulations, internal regulations and instructions in all phases of multimodal transport and especially in port operations, we have read and studied numerous ISO standards that are linked to each work process, we have studied systems of continuous improvement, management and management systems, logistical information and management systems and relevant causes and consequences. In analysing the influence factors (we separated human and autonomous systems) of selecting an appropriate model of managing individual logistical services, we looked for causal links between systems and tried to reach a specific subsystem that could define the need for improvement or exchange. We have taken into account the fundamental differences between transformational and transactional

changes (multimodal transport is a systemically sophisticated and complex system that requires a broad understanding of transport economics, organisational links and system management) and through these transactional or gradual changes, it is necessary to understand the continuous response to innovative, intelligent, human, environmental requirements. In fact, these changes mean a continuous improvement of the systems.

To underpin relatively well-known methods and systems of research into logistics and its individual services or processes, we used the most famous theories of world-famous authors, which proved very advanced in the result of the research. In order to establish a concrete thesis, we first had to obtain answers that directed us towards finding solutions and then we were able to define ourselves as a concrete thesis, which we solved through the answers to the questions asked. The thesis was the starting point for directing research in several directions and on the search for tools and models that would give us answers to the specific reasons for the replacement of raw materials. The complexity of logistical information and management systems dictated the need to integrate methodological solutions through forensic sciences, as we knew at the heart of the research that we had concrete answers, only they did not have sufficient evidence or arguments. Forensic methods and procedures for searching, collecting, checking and analysing individual granulates gave us answers to the questions needed to identify the specific cause. The findings are the starting point for finding new system solutions, as well as a starting point for the introduction of new and new intelligent systems and the control of logistics operations.

Based on a comparative analysis of the operation of different systems in the context of multimodal transport, literature studies and practical examples, as well as legal regulations and instructions for the operation of individual processes, we have come up with a model solution that can represent a certain paradigm in the management of the same or similar cases, at the same time presenting examples of good practice that can be used in some new events. The use of criminal and specifically forensic methods has helped us to obtain concrete data through the assurances of the professions and science that disproved human inclination or negligence, so it was possible to conclude the research in a positive sense and to ensure the satisfaction of all stakeholders. We are aware that this is just one example and a good attempt to draw attention to certain practices in service or logistics, and at the same time, this is an informative example that explains how forensic skills can be used to detect and prove individual theories, even in the field of logistics or in the context of its activities.

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