THE USAGE OF CHOSEN DIGITAL TOOLS IN THE PROCESS OF HUMANITARIAN LOGISTICS MANAGEMENT

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Abstract

In the XXI century digital transformation significantly contributes to humanitarian logistics improvement. Most humanitarian organizations consider the area of information and communication technology very important for efficiency in providing help and lifesaving. Through information and communication technology actors can conduct electronic training at a distance, coordinate activities and connect and align on time among each other. The successful implementation of humanitarian logistics operations depends on adequate and efficient use of digital tools. In this paper, using available secondary data and in-depth case study analysis we describe ERP software and web-based DSS applications and their use in humanitarian environments. Our findings show that despite the undoubted importance of information and communication technologies in humanitarian operations, the research of digital systems use in humanitarian logistics is still immature and has so far been mainly oriented towards the isolated effect of individual technologies on humanitarian logistics activities, such as storage, procurement, planning, human resources and finance. Considering this, the existing literature in this area is fragmented and dispersed into different streams of research, which hinders unique comparisons between technologies and makes it difficult to draw important conclusions about their goals in humanitarian logistics, domain adoption, as well as their implementation within the framework of humanitarian logistics. Also, humanitarian organizations lack integrated information technology, and only a small percentage of aid agencies rely on modern tools. These noted shortcomings shall be the starting points for our future research efforts in this area.

Keywords: Digital technologies, digital tools, information, communication, humanitarian logistics.

1. INTRODUCTION

The subject of this paper is a detailed analysis of the impact of ERP (enterprise resource planning) software and web-based DSS (decision support systems) applications on the implementation of the humanitarian logistics process and its key activities. In regular market circumstances, the incentive for timely delivery of goods and services of appropriate quality and price is to make a profit. In humanitarian operations, profit has been replaced by another goal, which is to provide adequate assistance to vulnerable areas and people.

ERP software and web-based DSS applications have a wide use in humanitarian logistics operations. Given technologies should improve coordination among humanitarian organizations, the operational and security environment for staff and timely access to critical information. The information provided relates to the entire range of relevant logistics data, such as: supplier efficiency, timeliness of response, information management and quality of donated goods. The mentioned aspects can be crucial for the preparation of future operations and plans.

The aim of this paper is to point out the importance of the role of ERP software and web-based DSS applications in humanitarian logistics operations for the sake of timely response to emergency situations and their effective management. As natural disasters cannot be predicted with precision, infrastructural and organizational unpreparedness represent an additional danger when reacting adequately and suppressing the negative effects of emergency situations. Bearing in mind these facts and specifics, it is of great importance that humanitarian logistics supported by technologies effectively respond to natural disasters, reduce the consequences and provide a good basis for future plans and actions.

Within this paper we conduct a systematic search in academic databases using relevant keywords to identify papers focusing on digital tools in humanitarian logistics. Selection criteria include relevance to the topic and direct discussion of digital tools' application, impact, challenges, or future trends. Selected papers undergo screening, evaluation, and data extraction, followed by synthesis and comparative analysis to identify common themes and trends. Quality assessment ensures rigor and validity. Findings are summarized, highlighting insights and recommendations for future research as well as open questions. The iterative process allows for refinement based on emerging findings and feedback. This methodology provides a systematic approach to review literature on digital tools in humanitarian logistics management.

The basic research questions used when writing this paper are as follows:

Research question 1: The possibilities of humanitarian logistics to effectively respond to natural disasters are conditioned by an ERP systems and web-based DSS applications and the degree of training of the participants to work with concrete technological solutions.

Research question 2: In actions to help affected areas, there is a negative correlation between drastic consequences and the use of ERP systems and Web-based DSS applications.

In addition to the introduction and conclusion, this paper is divided into three parts. The first part of the paper is devoted to defining the concept of Web-based DSS applications and their use in humanitarian logistics. The second part of the paper

explains the concept of ERP systems and their characteristics that can be of crucial importance in humanitarian logistics operations.

The last, third part of the paper is devoted to the analysis of the application of Web-based DSS applications and ERP systems within practical example of floods as a motive for the development and application of specialized electronic applications in humanitarian logistics activities in France.

2. WEB-BASED DSS APPLICATIONS IN HUMANITARIAN LOGISTICS

Humanitarian logistics is a branch of logistics that deals with the preparedness and response phases of a disaster management system. The critical factor for humanitarian logistics is time and effective response. Web-based DSS applications support aid agencies and organizations in disaster preparedness, response coordination, and risk mitigation. They facilitate situational awareness, resource allocation, and decision-making during emergencies and natural disasters to save lives and protect property.

2.1 Definition of the web-based DSS applications

A Web-based Decision Support System (DSS) is an application or system that insures decision support capabilities through web-based interfaces. It uses web technologies to provide information, analysis tools, and decision-making support. Data-driven systems, such as Decision Support System (DSS) and model-driven DSS, have become very powerful and sophisticated because they provide detailed information for decisions that allow a company to coordinate and integrate internal and external business processes much more precisely (Lawrence & Tavakol, 2007). DSS systems help companies to improve supply chain management (SCM) or to create a plan scenario for changing business conditions. These systems can be used to align customer relationships. To provide decision support tools for both employees and end users DSS today can use the interactive capabilities of the web (Campbell, 2005; Van Wassenhove, 2019).

The most important web-based DSS points are: web interface, data access and integration, platform independency, advanced analytics, data management centralization, cross functional alignment and collaboration, visualization, accessibility, data protection, scalability, real-time data integration, adaptability, customization and extensibility. A Web-based DSS can be accessed using well known browsers such as Google Chrome, Mozilla Firefox or Microsoft Edge. Overall, Web-based Decision Support Systems provide their users a strong network for data-driven inputs, encouraging collaboration and ensuring decisions in a fast-changing and interconnected world. Their accessibility, scalability, and flexibility make them indispensable tools for modern decision-makers across various industries and domains (Cordella, 2012).

While Web-based Decision Support Systems (DSS) offer numerous benefits, they also come with some potential limitations: they are dependent on internet connectivity, Security Concerns, performance and compatibility issues, data privacy

concerns, cost of establishment and maintenance, user education, control and the ownership of the data as data breaches, unauthorized access, and cyber-attacks. Despite these potential cons, many organizations believe that the good sides of Web-based DSS notable out-weight the potential limitations, even more when implemented thoughtfully and with careful awareness of data privacy, performance, costs and usability factors. By considering and allocating these negative factors on time, organizations can minimize risks and maximize the value of their decision support systems.

2.2 Advantages and disadvantages of the web-based DSS applications

All humanitarian operations depend on logistics, and logistics should be treated as a key priority in all humanitarian projects. The efficiency and effectiveness of humanitarian logistics can be greatly enhanced through the utilization of Web-based Decision Support Systems (DSS), which amalgamate data, use analytical tools, and implement human expertise to facilitate informed decision-making processes.

A web-based DSS is used to assist volunteers and humanitarian organizations in selecting the right route, to find the right medicines and help and to provide them in sufficient quantity. It can provide information from multiple sources. Other DSS combine transactional data from the website with data from the different organizations. With this system, users and organizations can take advantage of Internet information resources and web opportunities for providing a quick response to nature disaster. With a web-based and Internet-based DSS, decisions can be made by providing access to various databases and information repositories, along with data analysis software. The decision-making process can be conducted through CDSS. Today, organization's decision on which product and services will provide the best help is based on a greater amount of information than before (Maric et al., 2022; Tang, 2017).

One of the most significant advantages of Web-based DSS in humanitarian logistics is the ability to make real-time decisions. During emergencies, circumstances can change rapidly, needing swift and well-informed actions. Web-based DSS can gather and analyze data from various sources, such as weather forecasts, transportation networks, and supply chain inventories, enabling aid organizations to adapt their strategies dynamically in response to evolving situations.

Humanitarian operations often mean the allocation of scarce resources, including personnel, vehicles, and supplies, across multiple locations with diverse needs. Web-based DSS equipped with optimization algorithms can assist in determining the most efficient distribution of these resources, taking into account factors such as geographical constraints, demand fluctuations, and cost considerations (Kham et al., 2019). By optimizing resource allocation, aid agencies can maximize the impact of their interventions and reach more beneficiaries with limited resources. Humanitarian crises are requesting involvement of multiple actors and organizations, coordination and alignment among various entities are of tremendous importance for providing an adequate response. Web-based DSS provide a platform for sharing relevant information, coordinating activities, and collaborating with partners in real-time. By centralizing data and communication channels, these systems foster more effective

collaboration among humanitarian actors, empowering coordination, reduced duplication of efforts, and enhanced overall effectiveness of the response. Humanitarian operations are often fraught with uncertainties and risks, ranging from natural hazards to security threats. Web-based DSS equipped with risk assessment tools enable aid agencies to identify, evaluate, and mitigate potential risks proactively.

By building scenario analyses and contingency planning within these systems, humanitarian actors can develop adaptable strategies to cope with unexpected challenges, thereby enhancing the resilience and adaptability of their operations in volatile environments (Khan et al., 2022). Evaluation of humanitarian interventions is crucial for assessing their impact, identifying areas for improvement, and ensuring accountability to donors and beneficiaries. Web-based DSS can facilitate monitoring and evaluation by aggregating and analyzing data on key performance indicators (KPIs), such as delivery timelines, beneficiary satisfaction, and resource utilization. By providing stakeholders with timely and accurate insights into the outcomes of their actions, these systems support evidence-based decision-making and continuous improvement in humanitarian operations.

In conclusion, the integration of Web-based Decision Support Systems into humanitarian logistics represents a significant advancement in the field of humanitarian aid. By harnessing the power of data analytics, optimization algorithms, and collaborative technologies, these systems enable aid organizations to enhance their operational efficiency, responsiveness, and impact, ultimately leading to more effective and timely assistance for populations affected by crises and disasters. As technology continues to evolve, the potential for Web-based DSS to revolutionize humanitarian logistics and save lives remains boundless.

3. ERP SYSTEMS AND THEIR CONTRIBUTUION TO DISASTER RECOVERY

Solving the problem of controlling all major business processes with one information system in real time is made possible by improving the client/server data processing and Internet applications. Implementing an ERP (Enterprise Resource Planning - ERP) system is best achieved by integrating business processes and information resources. By using the ERP system, the organization improves product quality, increases efficiency, productivity and profitability. In the humanitarian logistics, organizations have different goal, saving people lives replaces profitability as the main purpose. In order to improve humanitarian response, humanitarian organizations must respond quickly to short-term changes such as beneficiary demands (such as agility), adapt to humanitarian environments that are dynamic and complex (such as adaptability), and integrate and coordinate processes with all partners participating (such as alignment) (L'Hermitte et al., 2016, Tatham & Kovács, 2018).

3.1 Definition, history, advantages and disadvantages of the ERP systems

ERP systems are software platforms that help organizations manage and integrate core business processes. These processes may include finance, human resources, supply chain, manufacturing, procurement, and more. ERP systems typically feature a centralized database and a unified interface to streamline operations and improve efficiency across an organization. Some of the most recognized ERP systems are: SAP ERP, Oracle ERP Cloud, Microsoft Dynamic 365, Net Suite, Info ERP, Workday etc.

The concept of ERP systems first showed up in the 1960s and 1970s with the growth of Material Requirements Planning (MRP) systems, which first focused on manufacturing processes and inventory management. The term "ERP" itself came into use in the early 1990s to describe software platforms that expanded beyond MRP to integrate various business functions across an organization. The most common advantages of ERP systems are: integration, manual work reduction, data management, streamlined operations, improved visibility, enhanced customer service, compliance and reporting, cost savings, standardized processes, improved collaboration and faster decision making. Overall, ERP systems offer numerous advantages for organizations seeking to improve operational efficiency, agility, and competitiveness in today's dynamic business environment (Arudin & Saidi-Kabeche, 2022; Scholz & Seuring, 2016).

Despite the all advantages mentioned above, there are also a notable disadvantages of the ERP systems mostly focused on the significant initial investment. Implementing an ERP system involves a significant upfront investment in terms of software licenses, hardware infrastructure, implementation services, and training. Beside the disadvantages caused by high costs, there are a few more negative sides of ERP systems highlighted: complexity, integration challenges, organizational changes, vendor dependency, performance issues and data privacy. However, having in mind all flaws as well as benefits of ERP Systems, organization see the good side more important for their operations particularly when ERP initiatives are well-planned, properly executed, and aligned with business objectives.

3.2 ERP Systems in Humanitarian response

Humanitarian groups function within unique and intricate settings, facing challenges like unpredictable demand, resource constraints, inadequate infrastructure, and heavy reliance on donor support (Gatignon et al., 2010). Agility, adaptability, and alignment are crucial supply chain aspects directly impacting performance, enabling organizations to detect and respond to environmental shifts, particularly in dynamic markets. The integration of all company departments and functions is a key aim of Enterprise Resource Planning (ERP) systems. ERP systems play a vital role in fostering Triple-A supply chain capabilities and are pivotal for effective humanitarian aid operations (Schniederjans et al., 2016). Despite the digital era, many humanitarian workers still utilize manual methods like paper lists and Excel files, lacking enterprise-level software features such as application integration and data compatibility. This reliance on outdated systems often leads to reactive management

rather than proactive supply chain strategies. Moreover, limited access to ERP software prevails among aid agencies (Gavidia, 2017).

To address operational hurdles and enhance response efforts, humanitarian organizations increasingly adopt or enhance their information systems, including ERP systems. Implementing ERP systems in unconventional contexts like humanitarian aid poses significant challenges and typically demands longer timelines compared to commercial settings (Gavidia, 2017). ERP systems in healthcare for humanitarian aid must adapt to unique circumstances characterized by infrastructure limitations, distribution speed priorities over precise inventory tracking, scalability for project adjustments, and specific ancillary item requirements. The development of information and communication technology, particularly ERP systems, for humanitarian groups is still in its early stages (Comes & Van De Walle, 2016). Nevertheless, the necessity for ERP systems incorporating a Triple-A perspective in humanitarian organizations is increasingly recognized. Designing ERP systems involves problem-solving and innovation to address organizational needs. Principles of information and communication technology design offer systematic approaches for developing ERP systems tailored to organizational requirements. Utilizing the content of humanitarian organizations' websites effectively fosters donor relationships. Establishing a compelling reason for donors to revisit the organization's website is crucial. Websites should offer comprehensive information and services beyond mere product details, ensuring visitors access essential information and services freely (Stoel & Muhanna, 2009; Wang & Wang, 2016; Sturgeon, 2015).

4. FOOD AID AS A MOTIVE FOR THE DEVELOPMENT AND USE OF SPECIALIZED ELECTRONIC APPLICATIONS IN HUMANITARIAN LOGISTICS ACTIVITIES IN FRANCE

In 2014, approximately 607 million individuals faced undernourishment, a figure that escalated to 811 million by 2020 due to the global pandemic (United Nations, 2021). Nevertheless, the Office of the High Commissioner for Human Rights (OHCHR) of the United Nations asserts the right to food as a fundamental human right, essential for the fulfillment of other rights such as health, life, access to water, adequate housing, and education (UNCHR). The United Nations' 2030 Agenda for Sustainable Development identifies food security as the second goal following poverty eradication. The Food and Agriculture Organization (FAO) defines food security as the continuous access to safe and nutritious food fulfilling dietary needs for active and healthy living (FAO; IFAD; UNICEF; WFP; WHO, 2020). Food insecurity is not confined to developing nations.

In France, addressing food insecurity involves public policy initiatives like the "fight against food shortage," which supports the food aid sector financially. This sector, predominantly relying on charitable efforts, operates through food aid offices. The intricate organization of food aid in France entails various actors—public, private, and associative—funding sources, food supply methods, logistics, and distribution channels. The COVID-19 outbreak underscored the significance of these offices while accentuating existing limitations (Cavaillet et al., 2021).

Almost all food aid in France integrates into a comprehensive structure involving public entities, private donations, and the operations of food aid offices, serving as its foundation. The primary food sources for these offices include budgets from the European FEAD and CNES, supplemented by donations from economic entities such as supermarkets and industries.

Within these organizations, information management is crucial, facilitated through various means including spoken, written, and electronic communication systems. Non-profit organizations managing food aid in France exhibit diverse structures and sizes, all striving to maximize their social impact through efficient resource management (Rousseau, 2007). Three prominent food aid initiatives in France include Association ReVivre, French Association of Food Banks, and the emerging Geographical Information System and HopHopFood smartphone App. This paper focuses on describing the latter initiative (République Française, 2016).

HopHopFood, founded in 2018, aims to bridge individuals in need with surplus food suppliers through digital platforms, combating food waste for the benefit of vulnerable populations. The Association's smartphone application facilitates access to unsold goods from local stores under favorable conditions for people with modest incomes, particularly those underserved by traditional food aid systems. Unlike commercial platforms, HopHopFood operates as a non-profit organization, emphasizing inclusivity and minimizing stigma associated with food assistance. Users obtain access codes from social workers to access the application and select desired products for pickup from participating stores. Retailers are compensated through fiscal incentives as per relevant laws. Despite its advantages, logistical challenges and limitations in product variety persist, albeit mitigated by HopHopFood's digital approach. This digital solution offers advantages over traditional methods, including inclusivity of all food types and streamlined logistics, facilitated by detailed performance metrics and evolving services provided through the smartphone app.

5. CONCLUSION

In the natural disaster management system, humanitarian logistics is a branch of logistics that deals with the preparedness and response phases. Humanitarian logistics is the process of planning, implementing and controlling the economical flow and storage of goods and materials. It is also the process of linking information from the point of origin to the point of consumption for the purpose of alleviating the suffering of vulnerable people. Humanitarian logistics includes a range of activities, such as preparedness, planning, procurement, transport, storage, tracking and customs clearance. Participants in humanitarian logistics are governments, the military, aid agencies, donors, non-governmental organizations and private sector companies. Business and humanitarian logistics have an economic function. However, the nature of demand in humanitarian logistics is highly uncertain because the disaster's timing, location and intensity are not known until the disaster occurs.

Humanitarian operations aim to provide adequate assistance to vulnerable areas and people. Management support systems in humanitarian logistics operations are DSS applications in a web environment and ERP systems. Through these solutions,

images, maps, videos and information can be sent and all ongoing humanitarian operations can be followed. Through one platform in humanitarian logistics, organizations can connect with all regional and local actors. The effectiveness of Web-based DSS applications and ERP systems in humanitarian logistics is demonstrated through responsibility, security, trust, transparency and speed. Digital solutions play a significant role in improving fast, fair and secure humanitarian logistics.

Humanitarian logistics of food aid has been developed in France. This humanitarian logistics relies not only on food aid to people in need, but also pays attention to their dignity. The food aid system provides an adequate response to specific forms of vulnerability that lead individuals (or groups of individuals) to a situation of food insecurity. Associations have developed application HopHop Food that connect retail chains that have food surpluses with people in need of food.

Based on the analysis within the paper both research questions have been accepted.

Further research on the impact of digital tools in humanitarian logistics is needed, focusing on empirical assessments of their effectiveness. Integration challenges, such as interoperability and data security, must be addressed, alongside exploring strategies for overcoming adoption barriers. Investigating how digital technologies like blockchain and AI can enhance supply chain resilience is crucial. Additionally, research should explore how digital tools can facilitate collaborative decision-making among diverse stakeholders. Ethical considerations regarding data privacy and equitable access must be examined, and efforts to build capacity and transfer knowledge on digital tools are essential for their effective utilization in humanitarian settings. Advancing research in these areas will contribute to improving the efficiency and effectiveness of humanitarian logistics operations worldwide. All these open questions and future research directions remain to be tackled.

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