

EARLY WARNING SYSTEM IN LOGISTICS PROJECT MANAGEMENT

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Abstract

Risk management is a vital process in all complex logistics project management. We discuss the concept of early warning system EWS dedicated to logistics project, which enable management under the conditions of uncertainty and risk. The complexity and uniqueness of the logistics projects as well as the discontinuity of the effects in the environment of goods and services, significantly impact the inability to eliminate the risks and subsequently lead to changes during execution. The introduction into companies and supply chains things such as: principles, methods, mechanisms of knowledge management and project risk, e.g. by implementing into the logistics project management the early warning systems can minimize the impact of unexpected, at the stage of initiation of the project, negative phenomena. Early information concerning risks enables to eliminate effectively later problems, in meeting the logistics project's schedule and budget, simultaneously constitutes a potential source of opportunities to accelerate the project implementation and project implementation below the assumed budget. The model of the dedicated early warning system should help policy-makers (logisticians) at the stage of the logistics project's planning and implementation, enabling undertaking decisions regarding its accomplishment and elaboration of the response plan in the case of appearance of a particular type of risk. Early warning system should aid logisticians with logistics project management undertaken in an company or in a supply chain. The developed approach extends previous work by the authors.

Keywords: Early warning system, weak signals, logistics project, project management, uncertainty, risk

1. INTRODUCTION

The success of a single company and a supply chain results from the skillful use of processes, principles, rules of conduct and resources in response to opportunities and risks that arise, including non-standard processes like logistics projects. Logistics projects play a huge role in improving a company's competitive position [1]. An important challenge in logistics and supply chains is appropriate management of logistics projects [2, 3]. The logistics projects play a significant role in logistics and supply chain [1, 4]. In many cases it is prerequisite for the creation of new business fields and for opening up additional markets and increase effectiveness of logistics systems and supply chains [5]. On the one hand companies and supply chains are nowadays seeking different approaches to cope with uncertainty and risk [6]. In order to cope with uncertainty and risk they undertake new groups of task i.e. logistics projects. Logistics projects can be used to improve logistics practice and supply chain practice [1, 3, 4]. Logistics projects are, by definition, a kind of projection of an intended future state, play a pivotal role in shaping, building, and delivering the future of companies and supply chains, and are by nature delimited by uncertainty. On the other early warning system EWS as a tool is concerned with looking into the future of the process or project including logistics project or companies, which is always uncertain, and discussing what it might mean for decision-making in the present or in the future [7]. The ability to react in real-time to hazards and disturbances, especially within time-critical processes, becomes more and more important for many companies and supply chain [6, 8]. In this context the availability of real-time data concerning current events in the logistics and supply chain of logistics project execution is essential. Therefore research in the field of early warning system of logistics project management is becoming more and more important.

This paper aims to identify how early warning system in the context of logistics project management and its value to the logistics and supply chain management and project management practice. This paper presents an overview of the concept of early warning systems in the literature. The authors presents approaches to the EWS including logistics projects and explains how they can be utilized as an early warning signal for avoiding failure in logistics project management.

2. LITERATURE REVIEW

A logistics project (type of specific project) can be defined as a planned set of interrelated tasks to be executed over a fixed period, limited by budget and time, which is carried out in order to improve the efficiency and effectiveness of product flows and of the associated information in companies, supply chains or spatial systems [2]. This is a non-routine set of tasks characterized by a timeframe, costs and organization, the aim of which is to perform a singular and unique action that sets out to optimize a specific logistics process [1].

Planning and implementing projects, including logistics projects, always involves a certain level of uncertainty. This is due to the fact that these projects are often innovative and unique and it is difficult to predict the direction of implementation in uncertain situations. This uncertainty is the result of not having full access to information regarding a project type, and can be defined as the probability that the objective will not reach its planned target value [9]. The internal and external conditions of logistics project are full of uncertainty, which stems from changing customer requirements, resource utilization, personnel mobility, economic turbulence, weather conditions, etc. Under such conditions, company and supply chains have to manage several different logistics projects. A multi-project context is common in contemporary companies and supply chains. Companies and supply chains increasingly use multiple logistics projects in their daily work to achieve their aims [1, 3, 4]. However, most logistics projects are either over budget, late or are simply not good enough [10] and still different people claim that those projects have been successful. In that context, the early warning system of logistics project has to be taken into account.

The ability to react in real-time to disturbances of undertaken logistics projects in companies and supply chains, especially within time-critical processes, becomes more and more important in order to achieve success. Therefore research in the field of early warning system in logistics project management is becoming more and more important.

The concept of the early warning systems is an instrument of strategic management [11, 12, 13]. Until now, this concept has referred exclusively to business management. In the few works dealing with project management, one can find a reference to the concept of Ansoff's weak signals [14]. Professor Igor Ansoff introduced concept of weak signal which appears to contain the kind of anticipation of surprising future events in the business. If Ansoff's thoughts on the uses of vague or inexact information can be applied to project work, there may be good possibilities of developing the sought-for tools for project leaders [7], including logisticians - logistics project leaders. The aim of any early warning system, including system in logistics project management is to deliver the right information product, in the right format, at the right place at the right time and to the right people; this is customer demand driven. Information of each logistics project execution are an important component of any early warning system in logistics and in supply chain management, delivering warning messages to designated recipients in time with appropriate information in the required quality and format. An important challenge in planning, execution and control of the undertaken logistics project in intra- and cross-company in supply chains is the capability to react to unforeseen deviations and disruptions. The basic functionality of early warning systems consists of detecting the event and quickly warning the users.

At present, the literature on early warning system especially in research of project and project management is very few [7, 15]. According to research made by Nikander [16], very little existing literature deals explicitly with the early warning system in projects and project management. The same conclusion was made by Klakegg [15] addressing that early warning systems in project and project management are under researched. The

problems of early warning systems in project and project management are mainly addressed through production projects, meteorological phenomena, natural phenomena, not through logistics projects. The literature of logistics project management includes some indirectly statements that are possible to interpret as examples of early warning system.

The approaches to early warning detection directly and indirectly mentioned in the project management literature are presented in the **Table 1**. The first column presents the early warning sources directly discussed in the literature with some examples of paper. The second column presents potential of early warning sources discussed indirectly in the project management literature. It includes such approaches as: stakeholder analysis, maturity measurement, extrapolation from earlier projects, cause and effect analysis, gut feelings, and interface analysis.

Table 1 Approaches to early warning systems in project and project management

| Early warning sources directly discussed in the literature | Potential of early warning sources discussed indirectly in the literature |
|--|---|
| Risk analysis | Stakeholder analysis |
| Project assessment methods | Cause / effect analysis |
| Project success / failure models | Maturity assessment |
| Earned Value Method EVM | Interface analysis |
| Decision support model of early warnings | Extrapolation from previous projects |
| | Gut feelings |

Source: [7]

A broad range of the project management literature points to early warning signs through the treatment of risk management as one important part of the early warning system [16, 17]. An example of the research done on the link between risk and early warning signs is the research done by Niwa [17]. The author outlines an approach based on the use of computer-based expert system. The developed concept of risk alarm was introduced as an advance warning of emerging problems. Another approach to early warning signals is Earned Value Method (EVM) [18]. The EVM system relies on a set of metrics that measure and evaluate the general state of a undertaken project [19]. According to paper [20] the EVM is a good forecasting or an early warning tool that enables project managers to plan and control projects proactively. Another large body of literature in the project management field deals with so-called project success factors, or sometimes their inverse, project pitfalls can be treated as approaches to early warning signals. This topic was also extensively researched by Nikander [16]. Many researchers and practitioners consider performance, effectiveness, and success as synonyms [21], which means that effectiveness is a synonym of success. It can be treated as the degree to which objectives are achieved [21, 22]. Various aspects of success were assessed: project efficiency (measured by the project management triangle), the project's impact on the client (measured by client satisfaction level), organization success (measured by the actual impact of project outcomes on the organization), as well as future-proofing (measuring how well project outcomes were aligned with the strategic goals of a company) [23]. Nevertheless, to date success has in principle been measured by business results. Today, we can note an evolution of project success concepts. Project effectiveness is synonymous with project success. It is measured or assessed in terms of the degree to which project objectives are achieved.

Another approach to early warning detection directly discussed in the literature of project management are various project assessments. They have also been discussed as a way to identify areas that should be addressed by EW monitoring. Project assessments go by many names, some of which are project reviews, PHCs, benchmarking, post project evaluation and project audits [15]. Assessments can take place during the project initiation stage and up to the project mandate stage, when the go / no go decision is made and even post-project completion. In the literature of the project management an we can find some relevant material on

project problems or pitfalls for example in [13, 16]. These approaches have been directly mentioned in the project management literature as early warning identification approaches. The compilations of typical project problems were presented in these papers. Another paper [24] presents cause-and-effect (cause-and-problem) chains in projects.

3. TOWARDS EARLY WARNING SIGNALS IN PROJECT MANAGEMENT IN LOGISTICS AND SUPPLY CHAIN

In the area of logistics and supply chain management we can find very few research addressing to early warning signals. Genca et al. [8] focus on presenting an early warning system for production in supply chains and evaluating its benefits regarding logistic objectives by using discrete event simulation. Quing [25] discusses the risk which business faced by the logistics system on the impact of corporate targets. He used the methods of knowledge management to establish the logistics risk early warning system. Wächter et al. [26] present aspects of the architecture of tsunami warning systems in general, including design criteria, information flows and main architectural building blocks. The authors of papers [28, 29] developed a database model as an architectural base layer of information logistics for geospatial EWS to disseminate customized messages in a multilingual environment, providing a generic approach to be applied to each EWS. In the paper [29] the concepts of generic information logistics was developed for the distant early warning system (DEWS). The tool is not limited to specific hazard types, languages or other deployment specifics. It enables the generation of user-tailored warning messages that account for specific needs, individual requirements, different levels of understanding, distinct perceptions and varying personal abilities. The presented system provides several filter mechanisms to avoid unintentional message flooding in emergency situations. This system is completed by a reusable graphical user interface component, which provides functionality to generate warning messages in compliance with the Common Alerting Protocol (CAP) standard to leverage inter-operability among early warning systems [29].

Another research [1] presents an approach to evaluating the effectiveness of logistics projects. The purpose of the study was to identify the critical factors determining the success of logistics projects and develop a model of logistics project effectiveness. The approach can be treated as an approach to early warning detection approaches. The study carried out by the authors had the form of questionnaires. The authors used a case study to validate the model of fuzzy decision-making system dedicated to estimate the level of logistics project effectiveness. The paper [5] presents a new approach for the evaluation of logistics service effectiveness, along with a specific computer system implementing the proposed approach - a sophisticated inference system, an extension of the Mamdani probabilistic fuzzy system. The paper presents specific knowledge concerning the relationships between effectiveness indicators in the form of fuzzy rules which contain marginal and conditional probabilities of fuzzy events. An inference diagram is also shown. A family of Yager's parameterized t-norms is proposed as inference operators. It facilitates the optimization of system parameters and enables flexible adjustment of the system to empirical data.

The limited research on possible approaches for identifying early warning system in logistics project management, the application of early warning identification approaches in logistics practice and supply chain practice and possible barriers against responding to them can be seen as research gaps. This paper is the one of first individual publication addressed to early warning systems in logistics projects.

4. CONCLUSION

The challenge for logisticians is to create an early warning system, which would allow the company and supply chain to transform incoming weak signals into useful information used in knowledge management of logistics project. The response, of the management to the quality of the flowing information into the early warning systems, may be the use of the weak signals concept, because it is assumed that every event, every change

is preceded by a series of information which, even though they are difficult to obtain (weak signals, as unstructured and incomplete) allow to undertake actions securing the enterprise against the consequences of change (or at least give time for the appropriate response). The model of early warning systems dedicated to logistics project management can serve as a tool to identify potential opportunities and threats in the life cycle of logistics project. The success of the logistics project accomplishment may depend on, among other things, the ability to respond in advance to potential opportunities and threats, avoiding strategic surprises that disorganize the implementation of the project. The accomplishment of particular logistics projects, completed successfully, influence the improvement of the company's competitiveness, as well as supply chain. This tool can be a valuable source of knowledge for logistics project managers in decision-making processes. An early warning system must provide information about relevant changes in the internal area, in the environment of the logistics project and make them available to analyze it. The introduction into the companies and supply chains things such as: principles, methods, mechanisms of knowledge management e.g. by implementing into the logistics project management the early warning systems can minimize the impact of unexpected, at the stage of initiation of the project, negative phenomena. The model of the dedicated early warning system should help policy-makers (logisticians) at the stage of the logistics project's planning and implementation, enabling undertaking decisions regarding its accomplishment and elaboration of the response plan in the case of appearance of a particular type of risk and / or opportunity. An effective aid of the early warning systems can be seen as a computer tool utilizing knowledge. In the processing of qualitative information, poorly structured, knowledge systems are useful. In the problems of the early warning, the knowledge system should help, among others, to integrate various methods and concepts of the early warning, to manage numerous collection of diverse information, to explain and interpret various information. As already mentioned, it is crucial to reduce the mistakes made while identifying weak signals. With regard to the early warning systems in the logistics projects, it is necessary to maximize the correct assessment and minimize incorrect assessment resulting from the analysis of signals. While designing early warning systems, achievements of the diagnostics theory should be used. Information flowing into such a system would have a post of diagnostic signals, which are the values of individual numbers or aggregated indicators or images obtained by measuring certain quantities: economic, technical, social, psychological and other.

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