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Modeling Supply Chain Performance

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Abstract

European countries actually adopt industry 4.0 and supply chain 4.0 philosophy. Enterprise modelling methodologies define enterprise as a system, which can integrate new technologies, Internet of things, automation and robotics in collaboration with people. GRAI methodology and its supporting tool GRAIMOD are used for modelling, analysing and improving enterprise supply chain performance. QCD (quality, cost and lead time) criteria are combined (in GRAIMOD) to social, societal and environmental dimensions for improving the company supply chain. This paper presents how lead-time criterion could be implemented for increasing supply chain performance. A real application is given for illustrating the concepts presented.

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Keywords: Carbon reducing, supply chain mamangement, quality management, knowledge management

1. Introduction

European countries have to adapt themselves to globalization impact on industry. Due to the low cost of workforce in emerging countries, they have to think about how to improve their organization for being more competitive. Then, industry 4.0 and supply chain 4.0 are crucial because of the introduction of new technologies, robots, automation, Internet of things and computer-aided tools in companies for increasing their performance. The question is how to standardize and elaborate processes of improvement and being sure about the result. How to use

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of the right tool according to company expectations, how to design and implement right technologies? Finally, how to help decision makers in the improvement of their companies?

New technologies are used here for improving company performance in terms of production quality, lead-time and cost management but also carbon and waste management, social, societal and environmental dimensions management. Indeed domains are technological (automation, regulation, robot, cobot, Internet of things, traceability), organizational (lean, 6 Sigma, kanban, MRP implementation), informational (computer aided system, expert system, decision aided system) and adapted to new constraints, enterprise future expectations.

Enterprise modeling appears as one way for solving the problem and giving adapted and structured solutions to companies. GRAI methodology is one of the three main methodologies for enterprise modeling. This methodology is used for analyzing companies technically, organizationally by taking into account human aspects, social, societal and environmental dimensions and for improving enterprise performance. GRAIMOD is a software tool used for improving enterprise performance with GRAI methodology.

This paper focuses on formalisms associated to performance criteria. KPIs are indispensable for measuring an existing system state, and compare it to future system vision. A zoom is made on lead-time criterion for showing how it could be used.

For illustrating and validating concepts and formalisms presented, a real application will be exposed.

2. Methodology and concepts

2.1. GRAI methodology and GRAIMOD

The objective is not to present GRAI methodology (see [1] for more detail on this methodology). In this paper the focus is on the use of GRAIMOD for improving enterprise supply chain [2]. GRAI approach consists in elaborating existing system models, analyzing them and proposing improvement and solutions. During the modeling phase, five models are elaborate. Performance criteria are used for measuring the existing and the future systems.

The performance of a system (supply chain) is improved by finding an optimum by combining criteria. The objective is the use of case-based reasoning, expert systems, multi-agent systems and computer aided tools [3, 4, 5], combined with new technologies for defining the best organization for a company.

Then GRAIMOD is composed of two sub-systems: analysis interface and improvement parts (fig. 1). The detail of modules and interactions is presented in [5]. This paper focuses only on lead-time criterion and defines concept and formalisms elaborated for realizing company performance improvement (according to lead-time criterion).

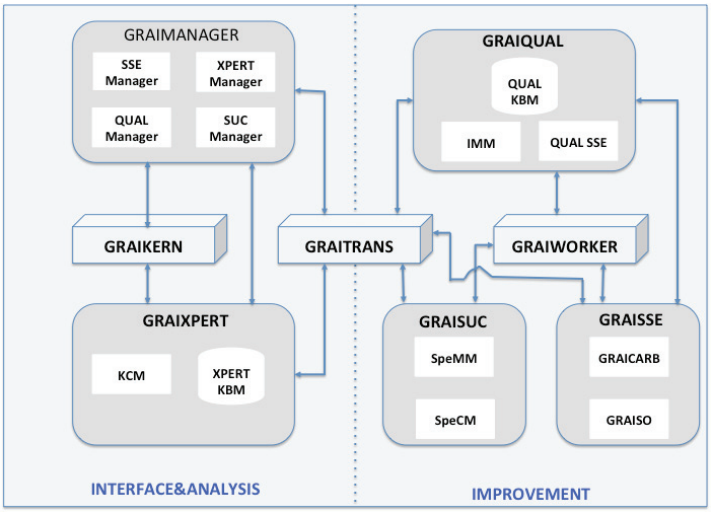

Fig. 1. Structure of GRAIMOD