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COMPLEX PLANNING AS DIGITALIZED TASKS FOR SUSTAINABLE SUPPLY CHAIN AND PROCESS MANAGEMENT

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INTRODUCTION

The main daily tasks of the managers in organisations are measuring, analysing, and communicating the degree of stakeholder satisfaction as well as planning activities to achieve the satisfaction. Additionally, to this diagnostic task, the managers should develop improvement activities to reach a higher level of stakeholder satisfaction [1]. As the environment is constantly changing and the information is not always complete and available, management decisions are made in certain, uncertain, and risky conditions. To achieve the company's goals in a volatile, uncertain, complex, ambiguity and dynamic (VUCAD) environment, managers are forced to make faster decisions but also to revise them as quickly as possible. These developments are increasing the complexity and the importance of planning on the operational management level in organisations. Different management approaches in composing budgets – like rolling forecasts -, as well as developments in reporting standards require different set-up in the budget planning with consequences of regularly changing the planning processes. On the other hand, methods, and methodical developments in operating planning of sustainable supply chains and in process management, are independent from these in budget planning, which indicates the request for improved solutions to connect these planning activities. The aim of the research is to outline a digitalized solution, so that it can be implemented as tool for supporting complex planning as digitalized management task. The study creates a model of integrated budgeting and operative planning as a supporting tool for management tasks by using approaches that are suitable for combining low implementation efforts with high illustration quality and is suitable for realizing as Artificial Intelligence (AI) solution. Since the authors were involved in several digitalization projects of management solutions in smart supply chains the developed model is empirically validated.

RESULTS

The results show that complex and integrated management tasks when fragmenting of the whole and complex tasks into different, smaller steps and focusing on essential management variables, allow enabling the usage of proper analytical and graphical solving methodologies so that they can be used for implementing machine learning (ML) algorithms and solutions like process mining or digital decisioning.

Furthermore, it underlines the ability to digitalize manual and cognitive routine activities in the decision preparation especially planning, which are traditionally dominated by the significant contributions from human beings. Additionally, it turns the analytical measuring and optimizing tasks into a management assignment, which overcome the limitations and challenges of present AI and ML solutions [2] [3] [7].

characteristics of management variables

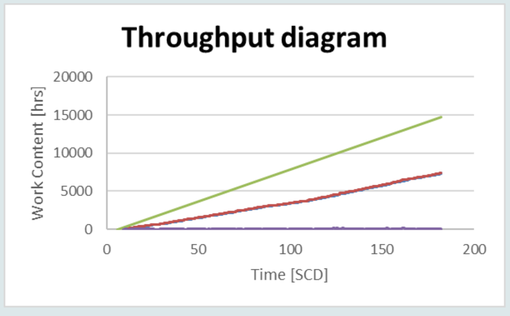
Characteristics	attributes			
Management task	Objectives	Actuating variables	Control variables	
Management level	Normativ	Strategic	Operative	
Impact of results	Design of management	Design of environment	Design of organisation	Design of interconnections
Sensitivity of change	Fix	Cube-fix	Step-fix	variable
Lever on content	Data	Information	Knowledge	Wisdom
Dependencies between variables	No dependencies	Causality	Correlation	duality	complementarity	entanglement
purpose	documentation	planning	Control	monitoring
Methods of identification, analysis and evaluation	Collection methods	Search methods	Analytic methods	Creativity methods
significance	Stock	Flow	Auxiliary	
measures	discrete		extended	complex	Methods	models
	Financial	Non-financial	Intangables			
Time frame	Past	future				
Time scope	One period	Multi period				

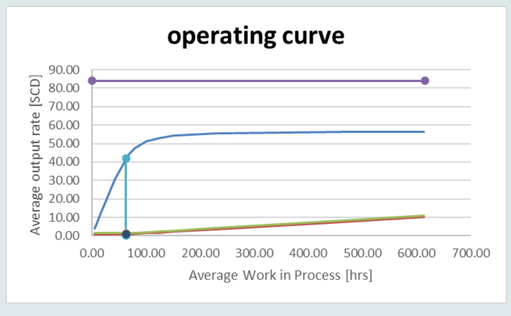
Budget planning - analytical approach

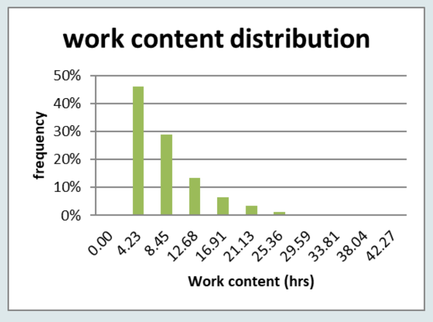
$$\sum_{a=1}^{A}\sum_{t=1}^{T}\left(OUT(T)_{a,t} * p_{a,t} - WIP_{m,t} * c_{c,a,t} - TOP_{a,t} * c_{p,a,t} - c_{m,a,t}\right) \rightarrow max!$$

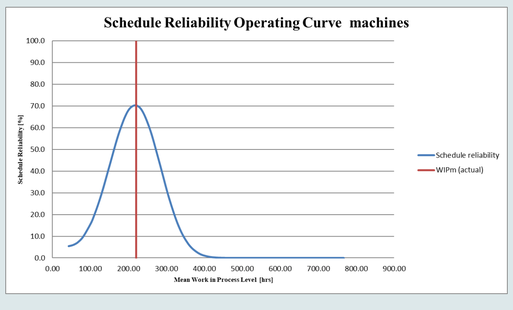
Sales revenue | Cost of capital | Cost of production | Cost of material

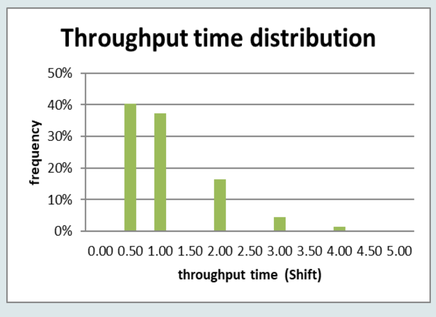
Results operational planning











1235	number of completed orders
6.00 hrs	average work content
5.49 hrs	standart deviation work content
0.91 SCD	average throughput time
1.49 SCD	average range
hrs/SCD	output
42.08 hrs/SCD	average output rate
56.35 hrs/SCD	maximum output rate
84 hrs/SCD	capacity
62.9 hrs	average work in process level
76.78 hrs	ideal minimum work in process level
81.9 %	relative work in process
74.7 %	average utilization rate
69.42 %	Schedule reliability

METHODOLOGY

It is proceeded as follows. First, the theoretical background to the study is outlined. It was described the structural element in decision making and planning as well as management of complex situations, paying special attention to integrative characteristics of composing budgets and operational planning in supply chain management and process management. Secondly, in the study it was also examined different modelling approaches suitable for combining low implementation efforts with high illustration quality and which are suitable for realizing as weak artificial Intelligence (AI) and Machine Learning (ML) solution. Building on this theoretical background, then, third it was characterised the modelling set-up of fragmenting the whole and complex planning tasks into different, smaller steps and its transformation direction as appropriate approaches for implementing into the digital solutions.

Then it was discussed the empirical implementation of these digitalized tools as well as potential development areas including the potential impact on decision situations and tasks, as well as impact on the needed competencies of users working with the improved solutions.

Finally, some brief conclusions are drawn.

CONCLUSION, CONTRIBUTION AND NOVELTY

The high complexity of management activities in VUCAD environments requires a holistic approach considered modelling case, organization and situation-based individual, dynamical and process depending elements, the modelling of the decision making-process on different management levels, the modelling of the cognitive process of intuition and deliberation in decision-making, as well as the tight integration of human decision activities and technology support [6].

The novelty of this approach is in the reduction of the complexity with focusing on essential management variables, which allows using also traditional solving techniques, methods, and models, but also enable to consider and use advanced approaches of weak AI and ML for solving these fragmented assignments.

The research result closes the gap in finding implementation approaches for supporting the management in solving complex decision situations and integrated planning tasks considering holistic system understandings and highlights the development areas for novel ideas. In the context the presented approach of this paper can be used as a blueprint for a good governance approach of solving decision situations in supply chains management assignments.

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