SUPPLY CHAIN IMPROVEMENT

Assessing readiness for change trough collaboration evaluation

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Abstract: Our goal here is to propose a practical model enabling the assessment of the readiness of cooperating organisational agents to face technological change. The focus is on the quality of cooperation and collaboration which we presume determines the agents' readiness for change. Providing such a model facilitates decision making in process design such as organisation design or product/services design. The transformation feasibility of existing cooperation is determined through a collective operational effectiveness evaluation. Lillian T. Eby et al. (2000) outlined that little empirical research has focused on this phenomenon. Amenakis et al. (1993) have proposed a theory-based model where readiness for change is perceived as similar to Lewin's (1951) concept of unfreezing. According to this theory beliefs and attitudes are core factors acting on organisational actors' perception of the readiness for change. Readiness for change relates to the employees' abilities and perceptions to face and support a pending organisational change. We consider the change in routines and practices of collaborating actors in interaction with the degree of activity change. In an organizational system based on cooperation, the various actors interact under a team spirit for a general interest and share a collective output. A certain degree of confidence and comprehension between actors is inferred. When change affects a company, technological or structural, organisational actors face change in roles, rules, methods, tools and habits. These transformations have an effect on the quality of cooperation and the related performance. We propose hereunder a methodology to measure the impact of change on activities accomplished trough cooperation. Our empirical research takes place in an organisation adopting a new technology in the maintenance sector.

1 INTRODUCTION

During the diagnosis phase of an organisational change, operating structures are analysed to evaluate the impact of change on staff and departments. When the concerned services are spotted, the changing processes and activities related to organisational roles and functions are defined. Our investigations begin at this level. We define with methods such as the cooperation evaluation scale and information transformation level, the needed knowledge, skills and coactions to fulfil a transformed activity. Our aim is to capture the extent to which current work practices are evolving and to define the prerequisite skills, knowledge, practices and tools to ensure compliance with corporate procedures and process. Readiness for change which is the organisation maturity to integrate new practices is evaluated through the potential change maturity model. We access the organisational capability to incorporate new business processes and mastering there possible evolutions.

We will first introduce the goal of the European integrated SMMART project and detail the innovative system use to improve the maintenance process in aeronautic and transport industry. Secondly, we will underline the potential changes due to this new embedded system and demonstrate the potential impact and the necessity to asses the readiness for change. In the third part of the article, we propose a “potential change capacity maturity model” and explain for each levels of the model the applied methodology.

2 SMMART EUROPEAN PROJECT

This model is being developed within an integrated European project entitled SMMART (System for Mobile Maintenance Accessible in real Time) regrouping industrial stakeholders form Aerospace, road and maritime transport. This consortium launched in November 2005 for a 3 year period is constituted of 24 industrials and research centres working on the development of RFID embedded system. The project, submitted under the Framework Programme 6 received contribution from the European Community. The aim of the project is to provide new technology smart tags capable of operating and communicating wirelessly in harsh environment of a vehicle’s propulsion unit.

This system will enable the monitoring of usage and maintenance data trough the life-cycle of critical parts and provide secure end to end visibility of the logistics supply chain (Figure 1). The project also aims to establish normative referential in terms of organisation, procedures and tools involving MRO (Maintenance Repair & Overhaul) stakeholders from manufacturers to operators, various regulation bodies and insurance companies. This should improve quality and traceability of maintenance operations, and finally safety of vehicles operation. The SMMART consortium incentives are meant to enhance European leadership in the worldwide MRO sector.

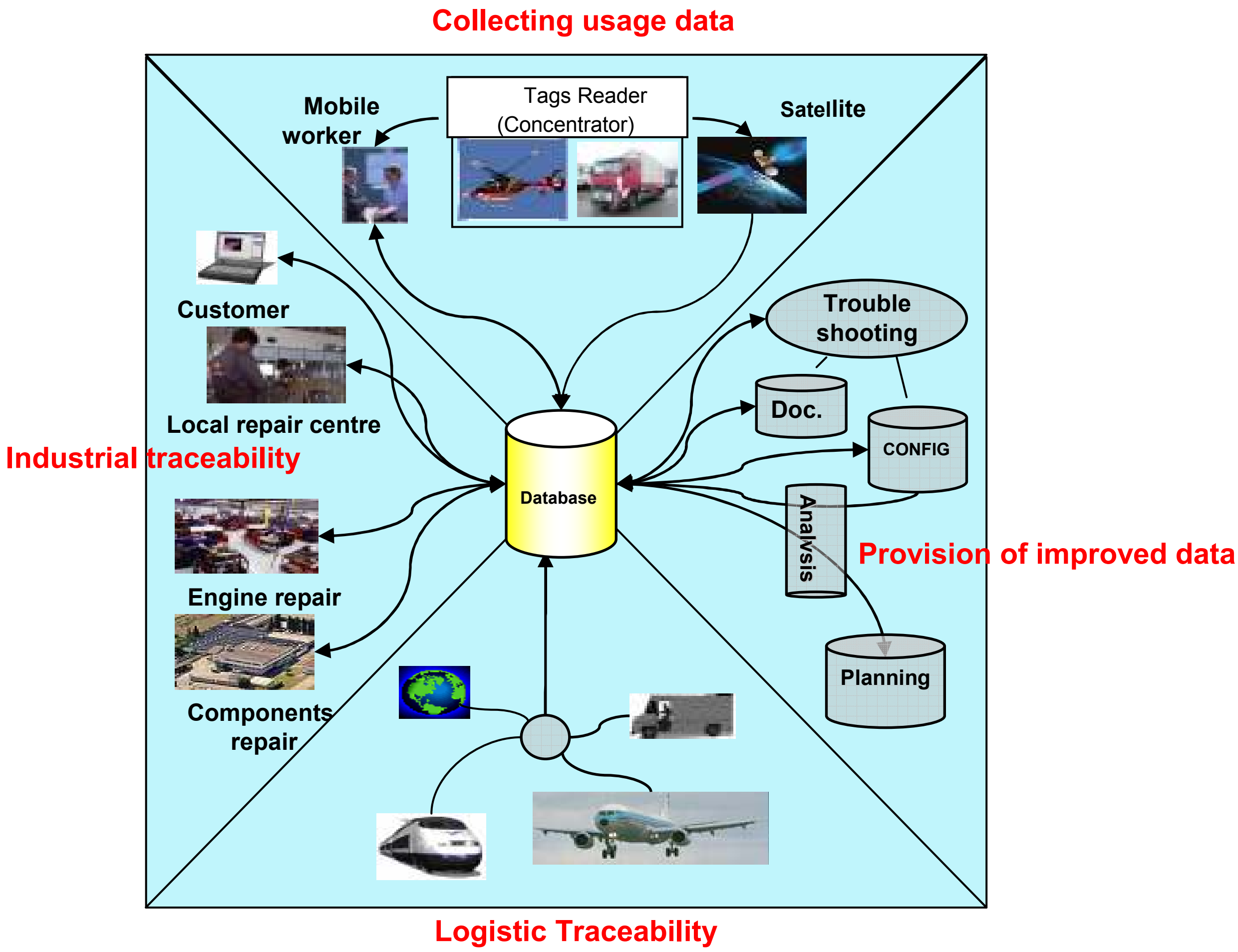

Figure 1: SMMART Concept Overview

Investing in such research and development activities compose a strategic stake for the transport industry. According to MRO professionals the worldwide commercial jet transport MRO market for example is expected to grow at a pace approaching 5 percent annually over the next five years. The issue is to decrease maintenance time in order to maximise time in the air. The adoption of new tools will transform the maintenance activity and the relationship among MRO stakeholders. Business process changes are expected and the corresponding support tool being prepared as through the developed potential change maturity model to ensure the operational capability of the SMMART technology.

2.1 SMMART impacts on product life cycle

In the previous paragraph the goal of the European SMMART project was described. The mixing of technologies allows improving the management of maintenance activities. Although the SMMART project is dedicated to maintenance process, the figure 2 shows the multiple impacts on the product life cycle. The SMMART Project integrates a global life cycle approach. As we can notice, there are indirect impacts due to the new embedded technology integration. We underline here the need to evaluate the capacity to change for an organisation. Our aim is to illustrate the potential changes in design process and identify the impacts on organisational actor's capabilities.

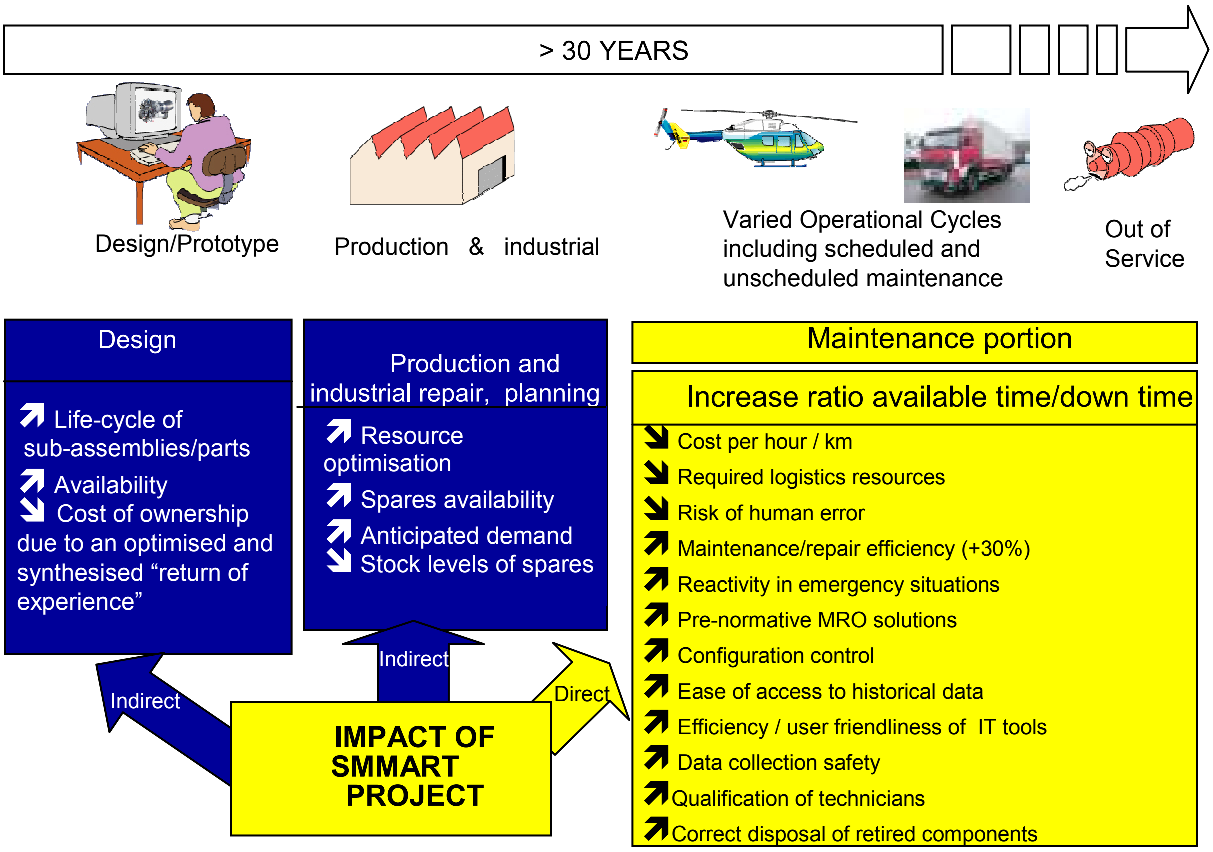

Figure 2: SMMART a global life cycle approach

For instance, we can identify two major changes in the design process. The first one deals with the transformations accompanying the technology integration. The second one with changes introduced by new information availability. We will develop hereunder the potential changes involve by SMMART project.

2.1.1 Potential technical changes

The gas engine is typically a mechanical product. The implementation of RFID tags, wireless sensors, and DCU (Data Control Unit) implies considering the new engine as a mechatronic product. Catherin (2006) defines the mechatronic as the simultaneous usage of mechanical techniques, electronical, automation, micro-computing and system analysis in terms of products design and optimization of devices and procedures. This mix of disciplines implies to rethink the product conception and another design logic adoption to design the new product. The mechatronic product should be rethought not only on the technical aspect but also in the functioning life cycle processes. Indeed, the mechatronic design follows a concurrent engineering approach (Kusiak, 1991). These technical changes will generate a need of tight collaboration between design actors. Following a concurrent engineering approach various professional corps participate to a common objective in collaboration with life cycle actors in the design activity.

Theses collaborations bring a need of information flow identification. Thus, to map the impacts on each organisational actors activity. We describe in the next paragraph, other changes due to the implementation of embedded technology SMMART.

2.1.2 Potential changes: Maintenance usage data in design process.

Considering the normal product lifecycle industrial loop, we focus our study on the potential added-value of the feedback from maintenance process to design process.

The SMMART embedded technology enables to have information about the functioning cycle of engines in real time. This real time system will provide more precise previsions enabling better reactivity to anticipate and face the various failures. Thus improving customer satisfaction linked to reparation effectiveness. In the scope of developing predictive maintenance the product failures data are merged and redesigned possibilities are considered to improve product reliability. This operation demands a tight collaboration between the maintenance stakeholders and design actors to identify the causes of events and evaluate the threshold to launch redesign campaign. The SMMART system brings new information in the current process and implies new activities, new collaboration and cooperation. To reach the integration of this innovative system, we need to map the impacts on each process and identify the concerned organisational stakeholders. This investigation will enable defining the need resources and support for the changed activities to stabilize.

In the two previous paragraphs, we have highlighted the needs and the potential impact related to the SMMART technology implementation. In the following part, we explain the proposed model for readiness to change assessment.

3. POTENTIAL CHANGE MATURITY MODEL

The model organised in 3 levels is designed to access the potential change and the organisational readiness to theses change. It is a practical tool to determine the prerequisites for processing from current state to an improve level of organisational state. Through each level a specific component of change is tackled by a set of assessments. Level 1 is the initial stage where the focus is the Change Impact Mapping on system level and on team and individual level. At this stage the As-Is organisational state is captured through interviews and the impacts of programmed change on processes and organisational structure is determined. Level 2 integrates 3 models evaluating the transformation of, information, collaboration and coordination between the As-Is state and the To-Be state. At this stage a consolidated picture of the programmed change impacts (TO-Be state) on the As-Is activity structure can be defined. The level 3 consist in measuring the necessary technical and human resources to transform an As-Is operating scheme. By the means of simulations and incremental adjustments the necessary efforts to improve the ongoing activity can be set. Theses 3 steps allow to diagnose the organisational variables that will evolve, the extent to which they will change and the organisational capacity to successfully introduce those transformations. The figure 1 describes our methodology to systematise potential change identification and change capability evaluation.

3.1 Impact Mapping

It is the first step where the impacts of the programmed change is characterised on the organisational activity. Through interviews the impacted processes and core competencies are determined. Core competencies as defined by (Hammel et al., 1990) are those capabilities that are critical to a business, it embodies an organisation's collective learning, the know how of coordinating diverse production skills and integrating multiple technologies.

employed by organisational actors to achieve the process goals and objectives. This level allows identifying "who" the organisational roles and functions and "what" competencies or tools, impacted.

3.2 As-Is V/S To BE

When the As-Is situation is set the To-Be one is designed considering all the impacted stakeholders in the various concerned processes. The Minel's (2003) Cooperative Evaluation Scale (CES) is applied to characterise the level of collaboration between 2 professions involved in a same activity. Useldinger's (2002) model defining as a six point Likert scale different levels of information is readapted to express the level of

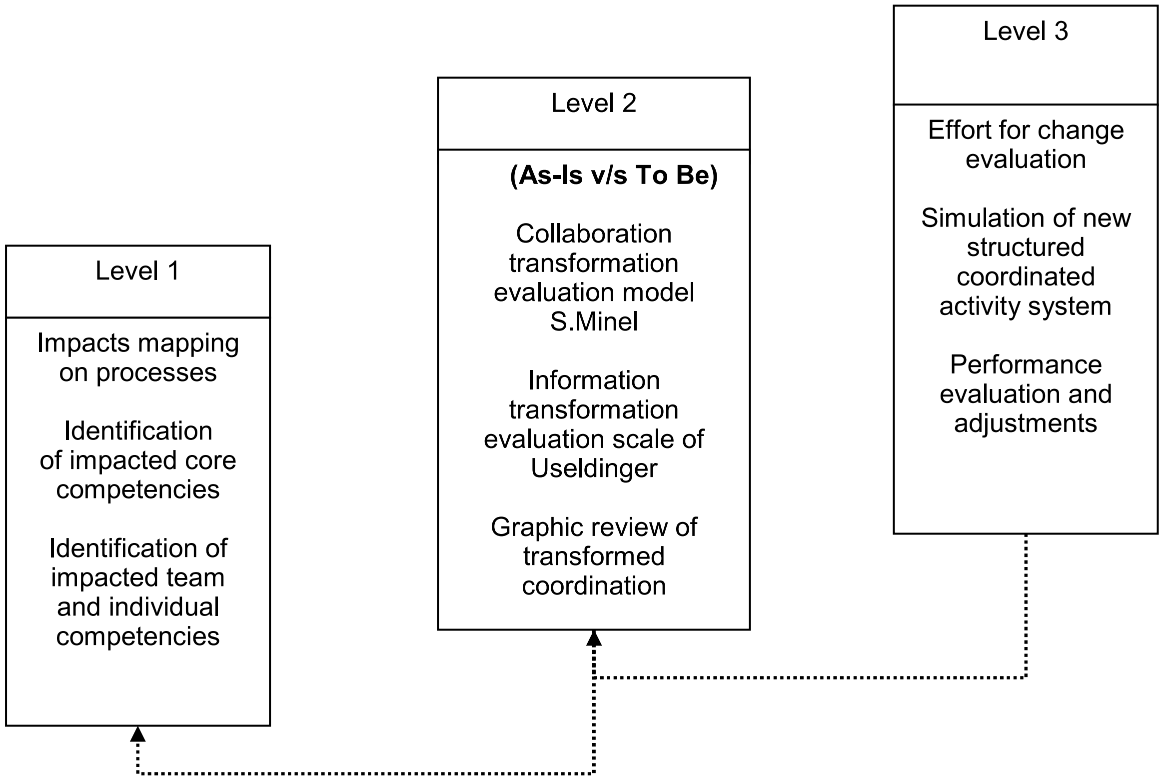

Figure 2: Potential change capability maturity model (O.Zephir 2006)

When the impacted core competencies are revealed, the link can be made to identify the teams and the individual competencies impacted. This step is crucial to fix the As Is state, it fixes the body of organisational knowledge and competencies that is concern by the change. The impacted process analysis reveals the related capability that is supported by the knowledge, skills and abilities

information change in an activity. Our investigation consists in the mapping of collaborating professions in the spotted impacted activities. We first carry an "As-Is" collaboration situation, to evaluate the level of cooperation before the change. Characterising the degree of cooperation allows defining targets related to change implementation. That is, when considering 2 professional corps collaborating, to determine if the same cooperative level is to be kept after change implementation or if it needs to be optimised. The Minel's (2003) CES considers 6 levels of collaboration, described by the level of knowledge shared by two interacting actors. The levels are as follows: 0 stands for no knowledge shared, 1 for common vocabulary, 2. Knowledge of concepts, 3. Knowledge of methods, 4. Master of domain, and 5 for expert of domain. Empirical studies show that in order to attain collaboration between two different professions, the level 3 of the CES is required to share a common vision of how to integrate the constrains of the other in ones own goals. Above this level, actors' specialised skills affect the cooperation. Under this level, cooperation is not efficient and can be improved. When the result of the "As Is" cooperation state is figured out, it has to be linked to the evaluation of the information changing state. This is carried out by using Useldinger's (2002) model where six level of information are defined as follows: Signal, data, information, knowledge, Skills and know-how. The model is similar to a 6 point Likert scale characterising (under a hierarchy) the different levels of information throughout different formalized schemes. The collaborating actors have to define in common the level of information changing in their activities. Defining that, allows evaluating to what extent the activity is changing, from the form of data or structure to competencies and know-how. Having those information collaborating actors are able to redefine their common activities, and also to state the needed resources, effort and support they need to collaborate under a new operating scheme. A similar evaluation is applied to evaluate coordination evolution from the As-Is to the To-Be situation there is no particular method applied here, but and indication on each described collaboration activity.

3.3 Effort for change evaluation

This last step is design to indicate for each transformed activity spotted in the level two, the necessary human and technical resources to deliver a constant process. Once the extent to which activity is being transformed is fixed, as referred in CMM models, simulations are programmed to evaluate the needed documentation, management and control to reach continuous process improvement through readjustments. The prerequisite skills, knowledge, practices and tools to ensure compliance with the corporate procedures and process are fixed at this level. We estimate that readiness for change is reached when technical and human capability is estimated in relation to a define service level with improvement possibilities. Readiness means here the organisational capacity to incorporate new business processes and mastering there possible evolution.

Referring to ADESI Specific Action (2004) we consider that the ability to answer to actual industrial stakes such as constant change, an integration of methods considering both human and technological dimensions is crucial.

4. CONCLUSION AND FUTURE WORKS

We have resumed in this article the potential change that the SMMART project can generate in the maintenance activity. The main issue for MRO organisations is to decrease maintenance time so as to maximize operation time. The SMMART concept is a technological enabler that has to be integrated in existing organisations to improve proactive maintenance capabilities. The organisational impacts are plural regrouping maintenance logistics and design process. We proposed a potential change capability maturity model which provides a practical framework to estimate the change project progression. Our next issue is to elaborate a strong simulation method so as provide reliable human capability evaluation. We still have to set the adequate method base on empirical researches analysis and strong theory evaluation. Our main focus trough this article was to present a practical model enabling the evaluation of technological change impacts on human and technical structure for new technology introduction. Our investigations aim at conciliating human and technical factors for optimal process design.

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