KEY-PROBLEMS AND MULTI-SCREEN VIEW
A Framework to Perform the Aligment of Manufacturing IS

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Abstract: In today highly competitive environment, the complete alignment of information systems (IS) that is to say not only with the strategy but also with the environment and with the uncertain evolution is crucial. For manufacturing IS these alignments are complex. The state of the art concerning IS alignment shows that the existing frameworks mainly concern managers and do not fit to the IS manufacturing context. On the one hand, B-SCP tends to operationalize these frameworks by coupling them to requirements engineering. However, only the alignment with the strategy is tackled. On the other hand, the dialectical analysis based approach of IS manufacturing development tries to integrate multiple alignments through the "multi-screen" view tool. However, the underlying concepts of this tool remain fuzzy. Therefore, this paper addresses the formalisation of the "multi-screen" view, in order to work out a framework for analysing mechanisms of multiple alignments of manufacturing IS. To do this, the contributions of coupling dialectics and "multi-screen" view to manufacturing IS are detailed through UML class diagrams. Moreover, to better grasp these contributions its similarities and differences with the B-SCP are outlined.

1 INTRODUCTION

In today highly competitive environment, information systems (IS) and related information technologies (IT) have become real competitive weapons. In this boarder, the IS alignment is crucial. In (Camponovo, 2004) it is suggested to study the IS alignment not only from the strategic alignment point of view, but to add two other levels enabling to achieve a global and complete alignment of the IS. The three proposed levels are the following:

- Alignment with the strategy (or strategic alignment): it focuses on aligning IS strategy to business strategy.
- Alignment with the environment: it concerns the alignment of the IS with the actors involved, their needs, uses, issues.
- Alignment with uncertain evolution: evolutions of the strategy and of the environment would require the IS to be aligned repeatedly. This level tends to incorporate, in the IS, features to cope with these evolutions.

As it is exposed in (Goepp, 2006), the alignment of manufacturing IS is complex. manufacturing facilities. Research in the strategic alignment field focuses mainly on the management issues by proposing theoretical frameworks. For example the framework proposed in (Polallis, 2003) provides a co-alignment model and a set of guidelines for theory building of IS and business practice aspects of IS. This kind of framework concerns managers and is difficult to put into action with the stakeholders involved in the development of manufacturing IS. Other researches like the B-SCP approach described in (Bleistein, 2006) suggests to operationalize strategic alignment frameworks by coupling them to a requirement engineering (RE) framework. B-SCP integrates the three themes strategy, context and process using a RE notation for each theme. This goal-driven approach enables to outline the business process elements, which are "critical" for the evolution. Here, the consistency between requirements and strategy is checked at a given moment. The alignment with uncertain evolution is not tackled. The complete application of B-SCP requires to work out a detailed business process model, a complete i* goal model, and a study of their interactions.

In (Goepp, 2006) it is shown that, for manufacturing IS, the drawbacks linked to the difficulty for domain experts to deal with the fuzzy

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and abstract concept of a goal, can be tackled through a key-problem driven approach. It combines a generic key-problem framework to an exploitation procedure in order to speed up the working out of an "*aligned"* IS architecture.

The key-problem framework is fully detailed in (Goepp, 2003), it is composed of three contradictions defined as:

- The contradiction for a class of systems to limit the study field,
- The contradiction associated to a generic function to be fulfilled by this class of systems,
- The contradiction between two performance parameters of this function,
- The contradiction expressed through a characteristic element of the function.

Alignment with the environment is implicitly ensured through mutually negotiated elicitation of the requirements. The use of the "multi-screen" view enables to perform a coarse alignment with the uncertain evolution and with the strategy. Indeed, it relocates (cf. Figure 1) the system under study both on a time scale (past, present, future) and on a systemic scale (sub-system, system, super-system). This key-problem based approach is limited by the scope of the projects it could tackle. Moreover, the "multi-screen" view, that supports alignment, is based on general but also fuzzy concepts. It is then not yet possible to formalise a structured approach to build efficiently a robust "alignment model".

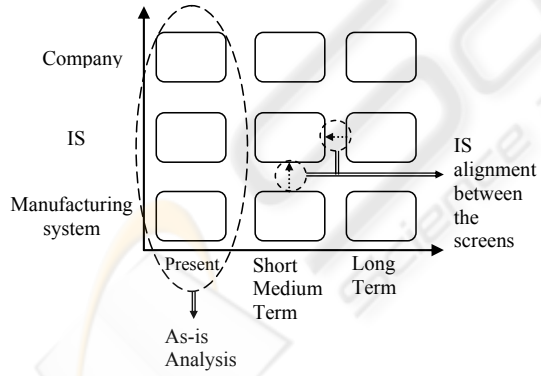

Figure 1: "Multi-screen" view tool.

This paper addresses the formalisation of the "multi-screen" view, in order to work out a framework for analysing mechanisms of multiple alignments of manufacturing IS. To do this, the contributions of coupling dialectics and "multi-screen" view, to the alignment manufacturing IS have to be detailed. Moreover, to better grasp these contributions its similarities and differences with the B-SCP are outlined. In section 2, B-SCP is introduced. In section 3, a model for the "multi-screen" view and an instantiation procedure are proposed. Corresponding concepts of B-SCP are discussed. In section 4, conclusions, perspectives and further research directions are discussed.

2 B-SCP

B-SCP has been fully described in (Bleistein, 2006). It proposes to operationalize the strategic alignment modeling framework originally proposed in (Walsham, 1993) by coupling it to RE notations and techniques. This modeling framework is structured around three themes: *business strategy, context and process* in B-SCP. The *strategy* theme refers to how an organization intends to use IT to compete within its market or industry. The *context* theme refers to the business and organizational environment in which an organization operates. The *process* theme refers to business activities, their support systems and other organizational resources, roles, entities and the interactions among all of these. For each theme a specific RE notation and technique is used. To the *strategy* corresponds the i* goal model, to the *context* the Jackson context diagram and to the *process* the role activity diagram. B-SCP suggests to use these techniques in an integrated. Concerning the strategy theme the i* goal taxonomy is completed with the Business Rules Group's Model for Organisational Motivation (BRG-Model). It puts in relation ends of the system (vision, goal and objective) and related means (mission, strategy, tactic) to achieve these ends. To perform strategic alignment the top-level problem diagram has to be refined by progression of problems.

3 "MULTI-SCREEN" VIEW TOOL MODEL

The "multi-screen" view tool is a two dimensional diagram, that organizes relevant concurrent evolutions of company sub-systems along time.

One dimension is obviously the time. A time pitch corresponds to the time span between two releases of the studied sub-system of the company: here the manufacturing IS of the company. The last time pitch corresponds to the longest time at which evolutions can be imagined.

The other dimension is the systemic scale at

which the company and its environment could be observed. The upper level is the Business Organization corresponding to the company and its relations with the market. This level is required to ensure, for the studied manufacturing IS, the alignment with the strategy. The lower level should be at least the level of Functional Units of the Company. Indeed, this level is understandable by all manufacturing IS users and therefore can support the alignment with the environment.

Relevant evolutions are classified according to these two dimensions. More it enables to model the network of impacts between evolutions.

3.1 Time Patches

Between the as-is time and the longest time at which evolutions can be imagined, the "multi-screen" view tool aims, at least, to identify the next release of the system. Therefore, there are at least: (1) as-is, (2) next-term and (3) long-term time pitches. However their number is not limited.

3.2 System Levels

While using B-SCP technics, intermediate levels are added by projections from upper level to the machine level. These system levels could be modeled into the "multi-screen" view tool by adding some intermediate system levels: at least the Business Process level, required for IS design (IS support business processes) (cf. Figure 2) but also, for instance, Enterprise Activities and Functional Operations according to the CIM-OSA Framework (Berio, 1999).

However, due to the number of business processes, in which the manufacturing functional units are implied in, and due to the detailed level of analysis required to address the machine level for manufacturing IS because of the heterogeneity of ITs involved on manufacturing facilities, this projection and alignment process are time consuming. More, it is difficult to ensure its robustness because manufacturing IS actors are not IS specialists.

3.3 Strategy Components

B-SCP focuses only on strategic alignment and relies on a strategy component taxonomy: the system means and the system ends. This taxonomy enables to deploy the company strategy on the IS.

Extending the IS alignment to the alignment with uncertain evolutions supposes to align both the IT evolutions along time (at the manufacturing IS level), and the evolutions within the communities of practice implied in the functional units. Performing it implies to deploy an IT strategy along time and a community of practice strategy. To succeed it we propose to analyze the evolutions between two time pitches by relying on the same taxonomy as B-SCP (cf. Figure 3).

Therefore evolutions gathered in the "multi-screen" view model have to be linked to the two kind of strategy components.

3.4 Evolutions

Evolutions modeled in the "multi-screen" view are linked to a time pitch, a system level and a strategy component (cf. Figure 4). We propose to model evolutions linked with the two kinds of strategy components on separate lines, at each system level. According to the B-RG model, it helps to clarify strategy deployment.

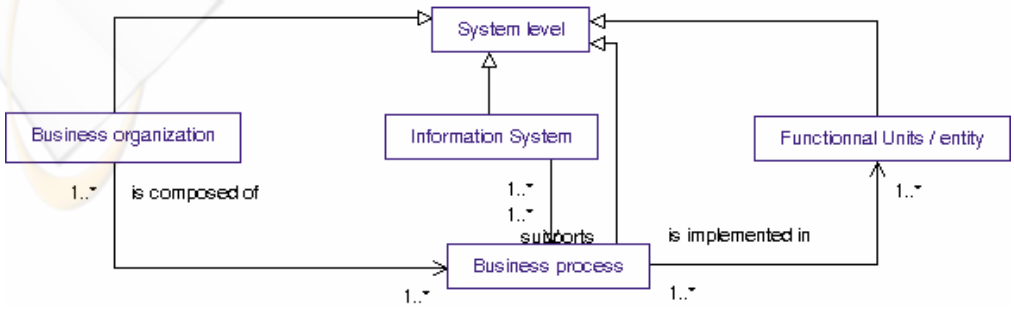

Figure 2: System level class diagram.

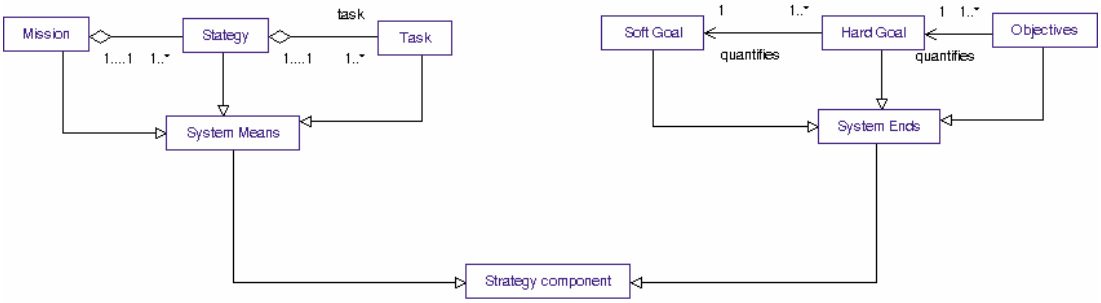

Figure 3: Strategy components class diagram.

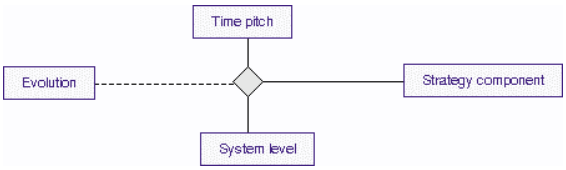

Figure 4: Evolution class diagram.

4 CONCLUSION

Figure 5 shows, at the concept level, how the underlying principles of dialectic analysis used in the key-problem based approach, helps performing a complete IS manufacturing alignment through the use of the "multi-screen" view tool. Indeed, gathering evolution contradictions highlights main variables (linked to system means) and states of performance (linked to system ends). It enables to spot the evolutions constrained by alignment concerns (pinpointed in B-SCP by shared phenomena) in the beginning of the analysis. Further work will aim to detail the links between evolutions and corresponding IS architectures.

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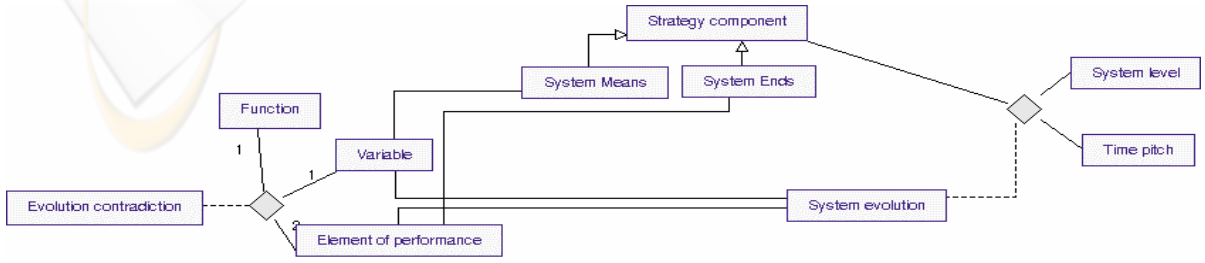

Figure 5: Links with dialectical analysis.