CHANGE PROCESS MODELLING
USING THE EKD-CHANGE MANAGEMENT METHOD

S. Nurcan[*,↗], J. Barrios[*1], G. Grosz[*], C. Rolland[*]

[*] *University Paris 1 - Panthéon - Sorbonne*
Centre de Recherche en Informatique
90, rue de Tolbiac 75634 Paris Cedex 13 France

[↗] *University Paris 1 - Panthéon - Sorbonne*
IAE de Paris (Business Administration Institute)
162, rue Saint Charles 75740 Paris Cedex 15 France

{nurcan, barrios, grosz, rolland}@univ-paris1.fr
phone: +33 (0)1 40 77 46 34 fax: +33 (0)1 40 77 19 64

Abstract
The Enterprise Knowledge Development - Change Management Method (EKD-CMM) provides a systematic way to organise and to guide the organisational change management. The EKD-CMM road map, implemented in the electronic guide book[2], describes the different routes to manage change through modelling using EKD-CMM. Roughly speaking a route is a sequence of steps to be followed by the EKD-CMM user. Every step in one possible EKD-CMM route is supported by guidelines. This paper presents the guideline allowing an enterprise to construct its change process model when its current goals, its external constraints, its future requirements and its existing processes are known. The undertaken modelling approach, called "goal deployment" approach, proposes an iterative process which consists in progressively generating the hierarchy of change goals by studying the impact of the external constraints onto the current goals and of defining the impacts of the change on current business processes. The approach is illustrated using examples borrowed to an industrial case of the electricity supply sector where change management is motivated by European deregulation rules.

1. INTRODUCTION

Companies are nowadays facing huge pressures to improve their competitiveness. Responses to these are restructuring, downsizing and reengineering along with a strong commitment to customer satisfaction. Organisational transformation then becomes a major issue. As stated in (Barrett 1994), organisational transformation depends of the creation of a powerful vision of what future should be like. We claim that an in depth understanding of the current functioning is also required. The systematic modelling of business knowledge can ease the complex task of building up the understanding of the business situation (Jarzabek 1996).

The Enterprise Knowledge Development - Change Management Method (EKD-CMM) presented in this paper provides a systematic way to organise and to guide the change management. It is currently applied in ELEKTRA[3] project, in which we describe the knowledge related to the change process in the Electricity Supply Industry (ESI) sector in terms of the EKD-CMM concepts (i.e. enterprise goals, enterprise processes etc.) (Loucopoulos *et al*. 1997), (Bubenko *et al*. 1997). EKD-CMM is a method that provides a systematic and controlled way of analysing, understanding, developing and documenting an enterprise and its components by using Enterprise Modelling. Its purpose is to provide a clear and unambiguous picture of (a) how the enterprise functions currently, (b) what are the requirements for change and the reasons for change (c) the alternatives that could be envisaged in order to meet these requirements and (d) the criteria and arguments for evaluating these alternatives (Bubenko *et al*. 1997).

The ELEKTRA project addresses the two requirements of (i) assisting in the development of EKD-CMM specifications (Rolland *et al*. 1997a), (Rolland *et al*. 1998a), (Rolland *et al*. 1998b), (Rolland *et al*.

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[2] The current version of the electronic guide book can be found at http://panoramix.univ-paris1.fr/CRINFO/EKD-CMMRoadMap

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1998c), and (ii) assisting in the management of change within the ESI sector (Rolland *et al.* 1997b). This paper deals with the second requirement. Within the ELEKTRA project, two complementary ways of working have been applied. They correspond to two possible routes among others to perform change management. These routes are included in the EKD-CMM road map that will be presented in section 2. We have been more precisely implied in the bottom-up route of the EKD-CMM in the restructuring the distribution of a European Electricity Company (ECOM). The main strategy used in this study, namely the *goal deployment strategy*, is presented in section 3. Section 4 introduces the electronic guide book. This tool has been developed to guide managers and change engineers involved in the change process management based on the EKD-CMM road map. Conclusion and future work are presented in section 5.

2. THE OVERALL VIEW OF THE CHANGE MANAGEMENT

2.1 Understand the change management within EKD-CMM

This section presents both the ethos and the details on the way the EKD-CMM proposes to undertake change management. The requirement for change usually takes the form of a vision held by some top managers. A classical example is John F. Kennedy´s statement: '*to send a man to the moon before the end of the decade*'. In order to implement such a vision, two major tasks have to be performed.

First, relevant habits must be analysed and the goals, policies and visions behind them must be made explicit. This is essentially a goal-driven abstraction process from existing practice leading to define the 'As-Is' model. Second, the vision must be established as a mission in this context leading to the 'To-Be' model which defines the requirements for the envisioned organisation. The quality of the 'As-Is' and 'To-Be' models depends on the knowledge elicited from the stakeholders and their involvement in the change process. According to Jackson (Jackson 1995), the 'As-Is' model describes indicative properties whereas the second one describes optative properties. As depicted in figure 1, mastering the change in an organisation requires four major steps.
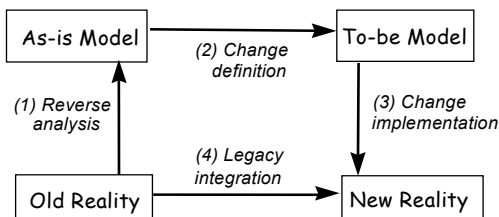

Figure 1. The EKD-CMM view of the organisational change

1 - *Reverse analysis* : Abstracting a model from current reality (As-Is model);

2 - *Change definition* : taking the vision for change into account, the required changes are studied and integrated for defining the model of the future organisation (To-Be model) ;

3 - *Change implementation* : Implementing the new organisation based on the To-Be model ;

4 - *Legacy integration* : Taking into account the existing context during the change implementation.

The change process (step 2 in figure 1) is defined as the process of establishing a vision for change in context. It is a complex process where several alternative change routes and many 'To-Be' model can be envisioned. In order to master this complexity, we propose to reason on the concept of scenario. A scenario is defined as one change route leading to one 'To-Be' model. On top of the need for defining the 'As-Is' and the 'To-Be' models, EKD-CMM suggests two more tasks consisting of first, modelling the alternative scenaria for change, and secondly selecting the appropriate scenario for change.

The EKD-CMM conceptual support for change consists in reasoning on models. The EKD-CMM process results in three models (the As-Is model, the To-Be model and the Change Process model) and identifies four states to be reached when performing change management. We refer to those as the four EKD-CMM states: (1) 'As-Is' state ; (2) 'Alternative scenaria for change determined' state ; (3) 'Alternative scenaria evaluated and the most appropriate one selected' state ; (4) 'To-Be' state.

EKD-CMM does not impose one single way of reaching the four states but proposes several ones. In other words, there are several routes that can be followed to reach the four EKD-CMM states required for managing change. These routes are integrated in the EKD-CMM road map.

2.2 The EKD-CMM Road Map

Change definition (step 2 in figure 1) is a decision making process. It is performed by stakeholders having the freedom to decide how to proceed according to their assessment of the situation they are faced to. However, change definition cannot be an ad-hoc and chaotic process. There is a high need for methods and tools which offers *guidance* to provide advice on which activities are appropriate under which situations and how to perform them (Rolland 1996), (Wynekoop and Russo 1993), (Dowson and Fernstrom 1994).

EKD-CMM views the process of modelling change as intention driven (Rolland *et al*. 1999). At any moment, the change engineer has an *intention*, a goal in mind that he/she wants to fulfil. Taking this into account, the EKD-CMM road map identifies the set of modelling intentions that have to be achieved in order to solve the problem at hand. There are two key intentions in EKD-CMM, namely "*Conceptualise Enterprise Business Process Model*" and "*Elicit Enterprise Goal Structure*". We refer to them as EKD-CMM Process Intentions. "*Conceptualise Enterprise Business Process Model*" refers to all activities required to construct a business process model whereas "*Elicit Enterprise Goal Structure*" refers to all those activities that are needed to identify goals and to relate them one another through AND, OR (exclusive OR) and AND/OR (inclusive OR) relationships. The two first are traditionally used in goal modelling (Nilsson 1971). The AND/OR relationship is required in order to make possible the expression of a multiple choice between several options.

A *strategy* is an approach, a manner to achieve an intention. The strategy characterises the flow from an intention *Ii* to an intention *Ij* and the way the intention *Ij* can be achieved when coming from *Ii*. The analogy can be made with a strategy to reach a location on a map. For instance, to reach Nice from Paris, one can imagine three strategies: fast, "andouillette", lazy. With strategy (1), the idea is to reach Nice as fast as possible. Strategy (2) is motivated by the desire to eat an "andouillette" in Lyon, where it originates from. In strategy (3), time is not important whereas, visit as much as one can in the French site is key factor. Clearly, the route to be followed to reach a point depends on the strategy(ies) selected.
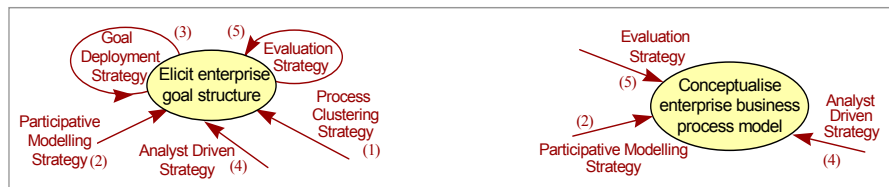

Figure 2. EKD-CMM process intentions and strategies

Similarly, the performance of the EKD-CMM modelling process is based on strategies to reach one of the two key process intentions "*Elicit Enterprise Goal Structure*" and "*Conceptualise Enterprise Business Process Model*" as shown in figure 2. Six strategies are used in the road map for organisational change, namely Participative Modelling Strategy, Analyst Driven Strategy, Process Clustering Strategy, Goal Deployment Strategy, Evaluation Strategy and Completeness Strategy.

For example, EKD-CMM offers different strategies to "*Elicit Enterprise Goal Structure*". Two of them are Participative Modelling Strategy and Analyst Driven Strategy. Both are possible ways to reach the same result, namely a goal structure, modelled using concepts of the EKD-CMM goal model. The former is more suitable when the method usage maturity and the organisational commitment are high. The latter is appropriate when these factors are low. The route (the precise sequence of steps) depends on the selected strategies. The multiplicity of strategies and routes justifies the need for a road map.

A road map is a process model in which a non-deterministic ordering of intentions and strategies has been included. It is a labelled directed graph with intentions as nodes and strategies as edges between intentions. There are two specific intentions called "*Start*" and "*Stop*" that represent the intention to start navigating in the road map and to stop doing so. The Completeness Strategy can be applied at any moment when the four EKD-CMM states have been reached. The road map contains a finite number of routes, each of them prescribing a way to develop the product, i.e. each of them is a EKD-CMM process model. Therefore the map is a *multi-model*. It embodies several process models, providing a multi-model view for modelling a class of EKD-CMM processes. None of the finite set of models included in the road map is recommended 'a priori'. Instead the approach suggests a dynamic construction of the actual path by navigating in the road map. In this sense EKD-CMM is sensitive to the specific situations as they arise in the process. The road map of figure 3 visualises all possible EKD-CMM routes as a graph consisting of

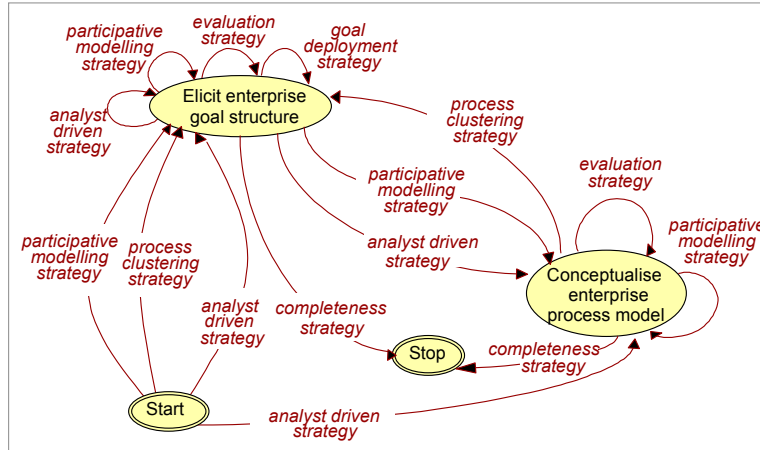the four process intentions and the six identified strategies.

Figure 3. The EKD-CMM road map

Roughly speaking, a route is characterised by the sequence of strategies it uses. More precisely, a route is a sequence of steps, each step corresponding to the achievement of an intention according to the selected strategy. For instance, the bottom-up route (so called because current business processes are modelled before enterprise goals) is defined as a sequence of six map sections.

B1 : *Conceptualise Current EBPM* from *Start* following Analyst Driven Strategy

B2 : *Elicit Current Goal Structure* from *Current EBPM* following Process Clustering Strategy

B3 : *Elicit Future Goal Structure* from *Current Goal Structure* following Analyst Driven Strategy

B4 : *Elicit Change Goal Structure* from *Current Goal Structure* following Goal Deployment Strategy

B5 : *Elicit Most Suitable Change Goal Structure* from *Change Goal Structure* following Evaluation Strategy

B6 : *Stop* from *Change Goal Structure* following Completeness Strategy

The stepwise description of a route shall be considered as a reminder of this route. There might be used during an EKD-CMM project, to visualise the route followed. Sections in the EKD-CMM road map are supported by guidelines. A guideline is a set of indications on how to proceed to achieve an intention. A guideline embodies *method knowledge* to guide the change engineer in achieving an intention in a given situation. The selection of the map section to carry out next identifies the guideline which supports this section. For instance, the guideline associated to map section <*Elicit Enterprise Goal Structure*, *Elicit Enterprise Goal Structure*, Goal Deployment Strategy> supports the change definition as it was introduced in figure 1 of section 2.1. This guideline will be developed and exemplified in the following section.

3. THE GOAL DEPLOYMENT STRATEGY AND ITS APPLICATION TO AN ELECTRICITY COMPANY

Change is generally a response to some significant threat or opportunity arising out-side of the organisation. According to Pettigrew '*Changes within an organisation take place both in response to business and economic events and to processes of managerial perception, choice and actions. Managers in this sense see events taking place that, to them, signal the need for change*' (Pettigrew 1985). Once the need for change is perceived, it is necessary to consider what the causes of changes are and what actually needs changing in the organisation. The main causes of change can be classified into 'external causes of change' and 'internal context of change' (Gilgeous 1997). In the organisation we have been working with (ECOM), the cause for change is external to the organisation. It concerns market evolution and change of legislation dictated by the European Union regulation along with competitor activities and customer expectations. Internal context of change relates to management structure, culture and system of power and control. The characteristics of the ECOM internal context, in other words its situational factors (low method usage maturity, low degree of participative involvement, hierarchical organisational culture, well known pressures), led us to use one way of defining change among the several others proposed in the EKD-CMM road map : the bottom-up route. Within this route, in order to define changes (step 2 in figure

1), it is suggested to use the goal deployment strategy.

The goal deployment strategy focuses on the analysis of the impact of the external constraints and the future requirements on the current enterprise goals. The product of the guideline implementing this strategy is a hierarchy of goals : *change process model*. It contains a particular type of goals, called *change goals*. Change goals tell us how to change the organisation, i.e. what should be improved, what should be introduced and what should cease to be performed. The change process model describes all possible change routes that the enterprise can follow to reach its envisioned future state in which all constraints imposed by the external pressures and future requirements will be satisfied. The application of this guideline leads to the EKD-CMM state 'Alternative scenario for change determined'.

This section presents the goal deployment guideline and its application in the distribution division of an European Electricity Company (ECOM). The resulting change process model describes alternative change scenaria that the ECOM distribution division can follow in order to reorganise itself to conform with the European Union (EU) rules. It precisely describes at an intentional level how changes can be performed. Section 3.1 introduces our approach to change process modelling. Application of this approach to the definition of the ECOM change goal hierarchy is presented in section 3.2. Section 3.3 presents the detailed algorithm for the generation of change goal hierarchy.

3.1 Approach to change process modelling

This section develops the goal deployment strategy followed in the ELEKTRA project to model the ECOM change process. The change definition (step 2 in figure 1) is a complex process as many alternative change routes and many future models can be envisioned. We propose scenaria as an appropriate means to support the definition of these alternative change routes and to achieve better stakeholder involvement. The change process model therefore describes how to perform the change and includes the description of alternative scenaria that the enterprise could follow in order to reorganise itself to meet the specific requirements for the future and to comply with the constraints external to the enterprise. As illustrated in figure 4, the change process model describes all possible change routes that the enterprise can follow to reach its envisioned future state in which all constraints imposed by the contextual forces will be satisfied.
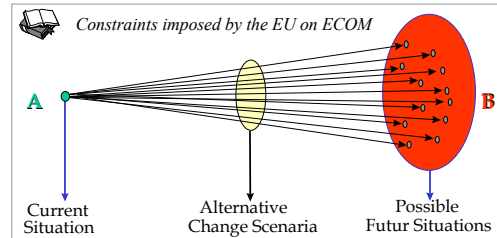

Figure 4. The change process

In the following, we first introduce the different hierarchies of goals that are used in the change process modelling using the goal deployment strategy and then present an overview of the approach.

3.1.1 The three goal hierarchies

The modelling approach uses two goal hierarchies as input and generates a third one. The former are referred to as the '*hierarchy of current goals* and the '*hierarchy of contextual forces'*. The latter corresponds to the *'change process model'*. The three hierarchies are goals graphs using AND, OR and AND/OR connectors (Loucopoulos *et al*. 1997).

The hierarchy of current goals. The hierarchy of current goals expresses what the enterprise aims to achieve in the current situation at different levels of abstraction. Figure 5 shows the first level of the ECOM's current goals hierarchy that we will use to exemplify the goal deployment guideline.
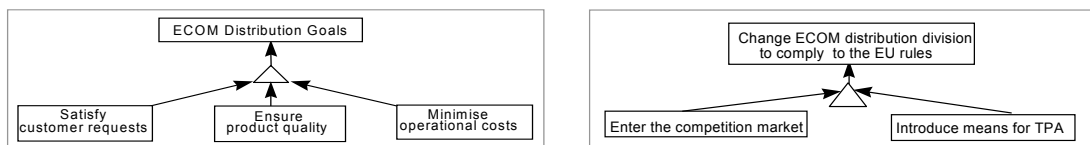
The hierarchy of contextual forces. A contextual force is a constraint external to the enterprise that shall be taken into account while studying the changes. In our case, this hierarchy reflects the constraints imposed by the EU on the ECOM distribution. This is highlighted in the top level goal named " *Change ECOM Distribution to comply to the EU rules* ". In order to satisfy this constraint, ECOM has already chosen to " *Introduce means for Third Party Access (TPA)* ". Furthermore, the fact that the electricity market will not remain a monopoly anymore in the future forces the ECOM distribution to " *Enter the competition market* ". These observations led us to describe the hierarchy of the contextual forces as depicted in figure 6. The two level hierarchy represents the positioning of the ECOM distribution with regards to the electricity market.

The change process model. The change process model is a hierarchy of change goals. It models the possible alternative change routes to be followed by the ECOM distribution in order to reach the envisioned future state complying with the constraints imposed by the EU. Because it includes alternative paths, the change process model proposes ECOM scenaria for change.

3.1.2 Overview of the change process modelling approach

The goal deployment strategy followed to construct the change process model is an iterative process which suggests to progressively generate the hierarchy of change goals by studying the impact of the contextual forces onto the current goals and to highlight the impacts of the change on current business processes. First, the current goal hierarchy is considered in a top down manner starting with the top level goal and examining its descendants step by step, until the leaves are reached. The hierarchy of change goals which describes the alternative scenaria for change is constructed accordingly, in a top down manner, step by step, by generating the change goals either as improvements of the current goals or by introducing new goals. Then, in order to facilitate the conceptualisation of the future enterprise state which will be performed afterwards, for each leave of the hierarchy of change goals, current processes which will be maintained, extended or improved will be attached. Roughly speaking the process followed in constructing the change goal hierarchy iterates for each goal in the current goal hierarchy on the two main activities: "*deploy goals*" and "*add new goals*". The former organises goal deployment by studying the impact of the contextual forces on the current goals, eliciting and introducing the change goals reflecting the impact and envisioning alternative solutions. The latter suggests to introduce new goals that complement a goal that has been elicited during the deployment step, to introduce alternative goals and to develop in detail all goals that have been introduced.

There are four ways to type the impact of a contextual force on a current goal. The type "*improve*" shall be used when there is no need to drastically change the current goal but rather to perform some improvements that lead to increase the efficiency of the current practices. The type "*maintain*" shall be used when there is no need to change the current goal but to keep it as it is. The type "*cease*" shall be used when there is a need to withdraw a current goal that is considered to be no longer beneficial for the enterprise. The type "*extend*" shall be used when the current goal is still valid but there is a need to enlarge its scope (e.g.. to add a new functionality, etc.). Accordingly, a change goal is elicited based on the type of impact and the current goal being impacted. A change goal can be achieved in several alternative ways with respect to different factors (quality requirements, market opportunity, technology availability, etc.). Envisioning alternative change goals means describing all possible alternative ways for fulfilling the change goal.

The fifth type of change goal, namely "*introduce*", shall be used when a change goal is totally new to the enterprise with regard to its current goals. The first task when adding new change goals consists in envisioning new complementary goals which should be necessary to comply with the change goal considered in the situation. As pointed in (Anton 1996), (Potts 1989) and (Dardenne *et al.* 1993), finding goals is very hard and no efficient way of solving this problem is known. Organising cooperative work and brainstorming sessions seems the most adapted approach to deal with this kind of highly creative activity in order to make ideas emerge. The EKD-CMM road map suggests to use the guideline *Elicit goal* which proposes three alternative ways for the goal elicitation: interviewing domain experts, perform SWOT analysis or follow electronic brainstorming strategy. Second, goals that are alternatives to the change goal considered in the situation should be envisioned and introduced in the hierarchy. This activity could be based on both the contextual forces and the future requirements. Finally, all change

goals that have been introduced previously should be developed. It is suggested to use the guideline *Reduce goal* providing three alternative means for reducing a goal: milestones driven reduction, case driven reduction or agent driven reduction (Dardenne *et al.* 1993). This guideline was presented in (Rolland *et al.* 1998a).

3.2 An illustration of the change goal hierarchy generation

As an illustration of the goal deployment strategy, let us consider the figures 7 and 8 which describe respectively, the ECOM current top level goals and the chunk of the change process model resulting of the application of the goal deployment strategy.
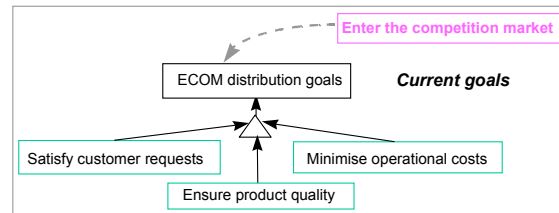

Figure 7. The impact of a contextual force on ECOM current top level goals

Clearly when ECOM will *'Enter the competition market'*, the company will have to deal with two types of customers: the non eligible customers and the eligible ones. The impact of the contextual force is therefore twofold: the current goal " *Satisfy customer requests* " is turned into 'Improve existing processes *to* " *Serve efficiently non eligible customers* "' and a new goal is set, namely " *Introduce new means to serve efficiently eligible customers* ". ECOM identified two ways to serve efficiently non eligible (and eligible) customers: by improving/adapting the current practices or by introducing an intelligent front desk. These two alternative change goals " *Serve efficiently non eligible customers* " and " *Introduce new means to serve efficiently non eligible customers* " are therefore introduced in the hierarchy (same for eligible customers).
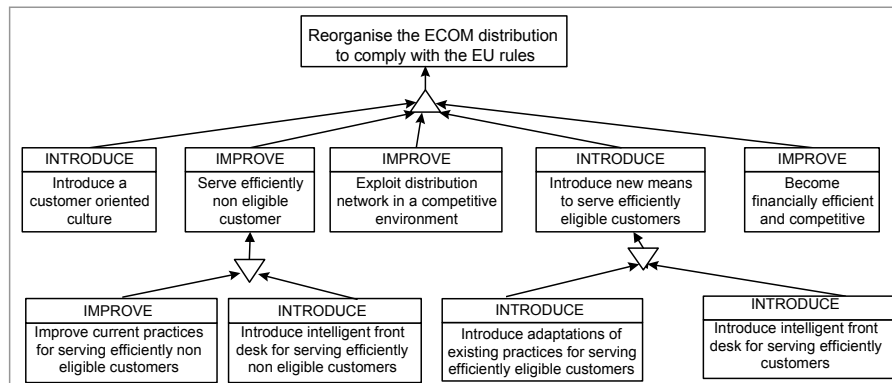

Figure 8. The resulting chunk of the change process model

In a competitive environment having a good quality product is maybe not enough and instead, it is necessary to improve the current processes in order to " *Exploit distribution network in a competitive environment* ". More importantly, ECOM should move from a situation where to " *Minimise operational cost* " was a satisfactory objective to a situation where it is necessary to " *Become financially efficient and competitive* ". Complementarily, it is clear that competitiveness will depend to a large extend of the customer satisfaction, requires to train the ECOM personnel and to " *Introduce a customer oriented culture* ".

To sum up, the three current goals, namely " *Satisfy customer requests* ", " *Ensure product quality* ", " *Minimise operational costs* ", remain with improvement and two new goals, namely " *Introduce new means to serve efficiently eligible customers* ", " *Introduce a customer oriented culture* " are introduced. The hierarchy of figure 8 is an excerpt of the change process model and reflects the impact analysis for change: the processes attached to the three current goals will have to be improved in the light of the change goals " *Become financially efficient and competitive* ", " *Exploit distribution network in a competitive environment* " and " *Improve current practices for serving efficiently non eligible*

customers ". In addition complementary processes will have to be defined in order to cope with the new goals, namely " *Introduce a customer oriented culture* ", " *Introduce intelligent front desk for serving efficiently non eligible customers* " and " *Introduce new means to serve efficiently eligible customers* " with its possible alternatives " *Introduce intelligent front desk for serving efficiently eligible customers* " and " *Introduce adaptations of existing practices for serving efficiently eligible customers* ". It shall be noticed that the impact analysis in this example results in (a) adding complementary goals (b) introducing alternative manners of proceeding and (c) improving current goals. This illustrates the way by which scenaria for change are discovered and introduced in the change process model.

3.3 The detailed view of the guideline implementing the goal deployment strategy

The iterative process which is formally described by the following algorithm is encapsulated into the guideline associated to the map section <*Elicit Enterprise Goal Structure*, *Elicit Enterprise Goal Structure*, Goal Deployment Strategy>.

For each goal G in the current goal hierarchy and its immediate sub-goals SG_i
    For each contextual force CF
          1) Deploy (G, SG_i) with regards to CF
            For each sub-goal SG_i
              1.1. Determine impact of F on SG_i
              1.2. Define the corresponding change goal C_i, and introduce it in the hierarchy
              1.3. Envision alternative scenaria C_{ij} for C_i, and introduce them in the hierarchy
          2) Add new goals
              2.1. Envision complementary goals C_k and introduce them in the hierarchy
              2.2. Envision alternative goals C_a and introduce them in the hierarchy
              2.3. Develop goals C_k and C_a

As it can be seen in this description (see the two *For each* loops), the generation of the change goal hierarchy is an iterative process. Each iteration is composed of two main steps which consist of deploying the current goals (Deploy (G, SG_i) with regards to CF), and then, adding new goals (sub-steps 2.1 and 2.2) and developing them (2.3). It shall be noticed that step 1 is always applied to a current goal (G) together with its sub-goals (SG_i). This structure is referred as a 'basic block'. Thus, each iteration in the process deploys a current goal based on the analysis of the corresponding basic block.

Step 1 consists in determining the impact of the contextual force CF on each SG_i. We have identified four types of impact namely, "*improve*", "*extend*", "*cease*" and "*maintain*" as developed in section 3.1.2. Thus, as illustrated in figure 9 the current goals SG1, SG2, SG3, SG4 are turned into C_1, C_2, C_3, C_4 respectively. Taking examples from the ECOM study, the impact of the contextual force " *Enter the competition market* " on the current goal " *Handle agricultural electrification* " is of the type "*maintain*". This allows to identify a change goal " *Maintain handle agricultural electrification* ". The impact of this contextual force on the current goal " *Offer services to public organisations* " is of the type "*cease*" and leads to the change goal " *Cease offering services to public organisations* ". When the impact on a sub-goal SG_i is typed "*improve*", the corresponding change goal C_i is named in a way which reflects this improvement. For instance, the impact of the contextual force " *Enter the competition market* " on the current goal " *Satisfy customer requests* " which is of the type "*improve*" is called " *Serve efficiently non eligible customers* ". When all change goals corresponding to the possible impacts have been introduced in the hierarchy, sub-step 1.3 consists in identifying *alternative* scenaria for them. For instance, in figure 9 the change goal C1 has two alternatives namely, " *Improve SG1 using the manner M1* " and " *Introduce the manner M2 for improving SG1* ". Figure 8 gives an example for ECOM: there are two alternatives to " *Serve efficiently non eligible customers* ", namely " *Improve current practices for serving efficiently non eligible customers* " and " *Introduce intelligent front desk for serving efficiently non eligible customers* ".

Sub-step 2.1 consists in introducing new *complementary* goals C_k which could be necessary to comply with the change goal C. In figure 9, " *Introduce C5* " is a complementary change goal which has been added in the change process model. The same applies to the goal " *Introduce a customer oriented culture* " in figure 8. Sub-step 2.2 of the change goal hierarchy generation consists in envisioning alternative goals C_a of C and introducing them in the hierarchy. This is illustrated in figure 9 by the change goals " *Introduce alternative to C* ". Finally, in sub-step 2.3, all change goals which have been introduced before must be developed in detail. This step is illustrated in figure 9 by the change goals " *Introduce the manner M2 for improving SG1* ", " *Introduce C5* " and " *Introduce alternative to C* ".

The development has been shown only for " *Introduce C5* " leading to the following change goals: (i) *Introduce C5 using the manner M'1* which is an ANDed goal composed of *Introduce C5.1* and *Introduce C5.2* ; (ii) *Introduce C5 using the manner M'2*.
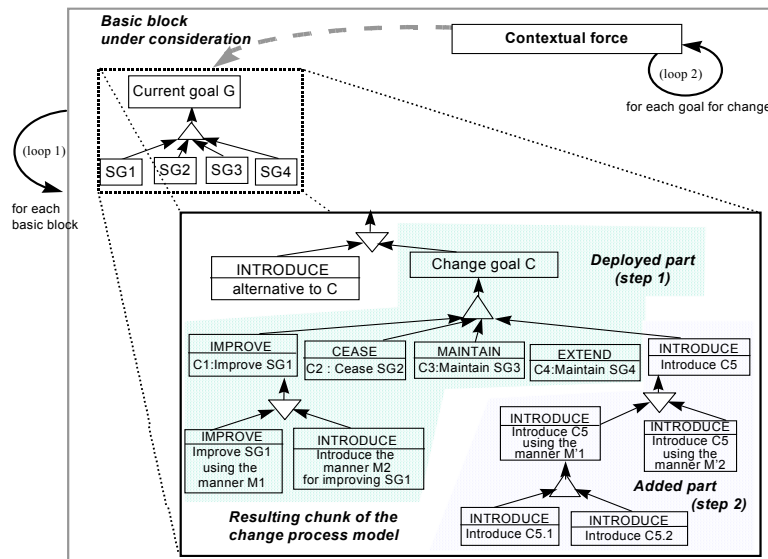

Figure 9. The change process modelling

The complete trace of the process that has been carried out to construct the ECOM change model is presented in (Rolland *et al*, 1998d).

4. THE ELECTRONIC GUIDE BOOK

The electronic guide book (Nurcan and Rolland 1999) provides a set of guidelines to understand EKD-CMM and to guide stakeholders involved in the change process to manage it. Following (Rolland *et al*, 1995), we consider a method as being composed of a set of guidelines. In the context of EKD-CMM, a guideline suggests how to progress at a given point of the EKD-CMM process, how to fulfil a modelling intention that an EKD-CMM user may have.

According to the contextual formalism developed within the ESPRIT project NATURE, we propose to describe a guideline using the concept of *context*. A context is defined as a pair <(*situation*), intention>. A *situation* is a part of the product it makes sense to make a decision on. It details when the guideline can be applied. What we mean here by product refers to the different EKD-CMM models. At the beginning of the EKD-CMM process the situation can be a problem statement, in other words some guidelines can be used 'from scratch'. An *intention* represents a goal a user wants to fulfil at a given point in time during the EKD-CMM process. It corresponds to the name of the guideline. The result expected of fulfilment of the intention is the target of the guideline. The result *produced* by this guideline is described using one of the EKD-CMM *models* (see figure 10).
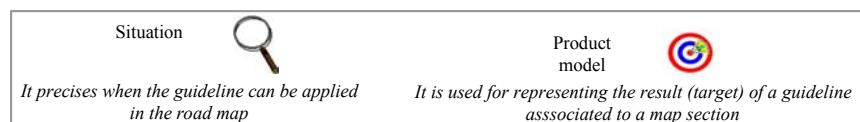

Figure 10. Symbols used in the description of the guidelines

For example, the guideline <*(Goal) ; Reduce goal>* considers a goal in the goal model as the situation and *Reduce goal* as the intention. In this case, what the EKD-CMM user wants to achieve is to decompose or to refine the goal of the situation into more specific goals. This guideline describes a set of different strategies for reducing a goal (e.g. using a case driven strategy, an actor driven strategy, etc.) and provides means for the selection of the most appropriate strategy. All the EKD-CMM guidelines available in the electronic guide book are described with respect to the following template:

Name of the guideline: It expresses a process intention.

> *Description of the guideline*: It provides a summary of the content of the guideline.
>
> *Body of the guideline*: It tells how to achieve the intention by providing steps, choices, activities to be performed and the related concepts to be used.
>
> *Situation*: It describes when the guideline can be applied.
>
> *Product*: It refers to one of the EKD-CMM models.

EKD-CMM guidelines are organised into hierarchies. Links between guidelines are of two kinds: refinement links allowing the refinement of a large-grained guideline into finer ones and composition links for the decomposition of a guideline into component guidelines. Guidelines are of three types, namely *choice*, *plan* or *executable*. The EKD-CMM knowledge is defined as a hierarchy of guidelines having executables ones as leaves of this hierarchy.

When progressing in the EKD-CMM process, the user may have several alternative ways to solve an issue. Therefore, he/she has to select the most appropriate one among the set of possible choices. In order to model such a piece of EKD-CMM process knowledge, we use the first type of guideline, namely the choice guideline. The body of a *Choice Guideline* offers different alternative ways for achieving the process intention. For example, the context *<(There is a need to move the organisation from the current state to a future state), Construct change process model>* is a choice guideline (figure 11) introducing two alternatives to the construction of the change process model, each alternative proposing a specific strategy, namely *follow goal deployment strategy* and *follow participative strategy*. Arguments (in italics in figure 11) are defined to support the various alternatives of a choice guideline and to help in the selection of the most appropriate one. Like in IBIS (Conklin and Begeman 1988), decisions are motivated by positions which are themselves supported or objected by arguments. For example, to *follow goal deployment strategy* is the right decision to make when current enterprise goals, requirements for the future and contextual forces driving the change are known. It is important to notice that the alternatives of a choice guideline are guidelines too. In our example, the first alternative guideline, namely *follow goal deployment strategy*, is a plan guideline.
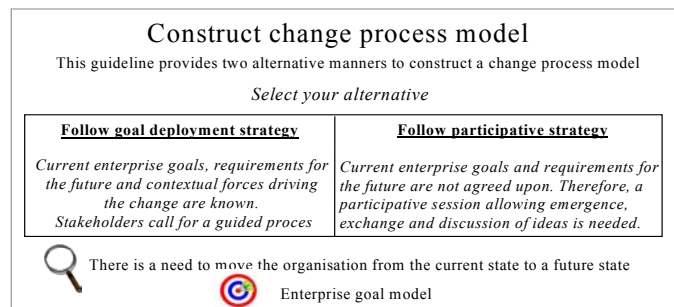

Figure 11. An example of choice guideline

In order to represent situations requiring a set of decisions to be made for fulfilling a certain intention, the EKD-CMM process modelling formalism includes a second type of guideline called the *Plan Guideline*. A plan guideline can be looked upon as a macro issue which is decomposed into sub-issues, each of which corresponds to a sub-decision. Components of a plan context are also guidelines. For example, the guideline *<(ST0=Hierarchy of current goals, contextual forces, future requirements, documentation on existing processes), Follow goal deployment strategy>* is a plan guideline composed of two component guidelines, namely *<(ST0), Construct a hierarchy of change goals>*, and *<(ST0 and hierarchy of change goals constructed), Attach processes>*. This means that, when using the goal deployment strategy, the EKD-CMM user has first to construct the hierarchy of change goals and then to attach processes to the leaves of this hierarchy as shown in figure 12.
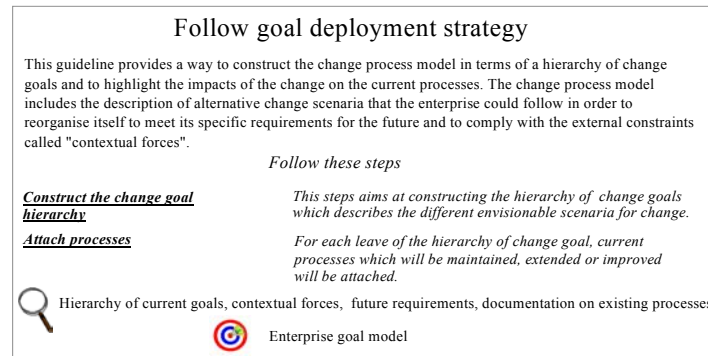
Figure 12. An example of plan guideline

An *Executable Guideline* corresponds to an operationalisable intention which is directly applicable through a set of activities. The body of an executable guideline proposes a set of activities to be performed for achieving its process intention. For instance, the executable guideline *<(Hierarchy of current goals, contextual forces, future requirements, documentation on existing processes), Construct a hierarchy of change goals>* suggests to perform the activities described in the algorithm of section 3.3.

5. CONCLUSION

The paradigm of Business Process Reengineering and Business Process Improvement contrast with traditional information system development that focused on automating and supporting existing business processes (Guha *et al*. 1993). Now, enterprises should create -entirely- new ways of working to survive in a competitive environment. The intention based modelling used in EKD-CMM provides basis for understanding and supporting organisational change and helping the development of information systems supporting these organisation. Change management is a highly creative activity and therefore cannot be fully prescribed. Accordingly, the EKD-CMM road map contains a finite number of routes and none of them is recommended a priori. In fact, the appropriate route needs to be dynamically constructed according to the situational factors, such as organisational culture, ability to commit human resources, social skills of participating actors, use of software tools, the familiarity with applied strategies and supporting technologies.

Roughly speaking a route is a sequence of map sections to be followed by the EKD-CMM user. Map sections are supported by EKD-CMM guidelines. Guidelines are organised in a hierarchical manner through successive refinements and decompositions in order to guide the user in the use of the method. The EKD-CMM road map allows the dynamic selection of methodological guidelines to be applied in the situation at hand according to the intention the change engineer has in mind.

In this paper, we developed the guideline which is provided to the EKD-CMM user to define the enterprise change process model following the *goal deployment strategy*. This guideline suggests an iterative process which consists of progressively generating the hierarchy of change goals by studying the impacts of the contextual forces onto the current goals and of highlighting the impacts of the change on current business processes.

The benefits for the ECOM company for having used the approach presented in this paper are the following : (a) The systematic and guided search for alternative manners to achieve a change goal, being either an improvement, an extension of an existing goal or the introduction of a goal was very positive. Indeed, it helped the stakeholders to envisage innovative solutions ; (b) Because the goal deployment approach uses as input the 'As-Is' state, the stakeholders were able to point the impacts of the change they proposed on the existing processes ; (c) Using the output of the goal deployment approach, the change model process, the stakeholders are now able to carry out an informed evaluation of the alternative scenaria for change to select the most appropriate one (step B5 in the bottom-up route).

According to (Kotter, 1991), products and services require different marketing, financial, operations and purchasing strategies in each stage of their life-cycle (introduction, growth, maturity and decline). This has implications for the way in which operations should be managed, in other words, for the way in which change goals -typed introduce, maintain, improve, extend and cease- should be operationalised.

Our proposal is currently limited to change definition (step 2 in figure 1), taking into account the organisational situational factors. We are now defining means by which the required changes can be

effectively implemented (step 3 in figure 1), i.e. to support the "enactment" of the change process model. We also study how the characteristics of strategic options for the management of change as defined in (Gilgeous 1997), ranging from "revolutionary change" to "evolutionary change", can be introduced in the change process model. Similarly, the various ways by which resistance to change can be tackled (Kotter and Schlesinger 1979) are studied for introduction.

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