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# Focus Issue on Legacy Information Systems and Business Process Change: Modelling of Organisational Change Using the EKD Framework

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***FOCUS ISSUE ON LEGACY INFORMATION SYSTEMS  
AND BUSINESS PROCESS CHANGE:  
MODELLING OF ORGANISATIONAL CHANGE USING  
THE EKD FRAMEWORK***

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**LEGACY INFORMATION SYSTEMS  
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**ABSTRACT**

Little attention has been given in the development of a systematic approach for elaborating and using enterprise knowledge to manage organisational change. In this paper we present a framework based on the confluence of two technologies: enterprise knowledge modelling and process guidance. The framework comprises of a set of modelling components for describing intentional enterprise knowledge, and a number of strategies for reasoning with enterprise knowledge during organisational change projects. Dynamic selection of appropriate strategies is guided by the use of a methodology roadmap. The approach is demonstrated using examples from an industrial application of change resulting from de-regulation in the electricity supply sector.

**Keywords:** enterprise knowledge modelling, process guidance, change modelling.

## I. INTRODUCTION

Rapid and turbulent market changes such as electronic commerce, deregulation, mergers, globalisation and increased competition led to a constantly evolving business environment. These causal forces manifest themselves in the need for on one hand, integration of both business processes and support systems and on the other hand, externalisation of business practices. At the same time, organisations also experience the effects of the integration and evolution of information technology. While information systems continue to serve traditional business needs such as co-ordination of production and enhancements of services offered, a new and important role has emerged: the potential for such systems to adopt a supervisory and strategic support role. These developments offer opportunities for changes to organisational structures and the improvement of business processes.

Based on research and application to many industrial and commercial applications, we believe that 'the most important factor to successful business evolution is enterprise knowledge management' [Kardasis and Loucopoulos 1998; Kavakli and Loucopoulos 1998; Loucopoulos et al 1998; Rolland et al 1998]. Indeed the key to successful business change is knowledge shared by multiple enterprise stakeholders about:

- (a) where the enterprise is currently;
- (b) where the enterprise wishes to be in the future; and
- (c) alternative plans to effectively bringing about desired transformations.

To this end, this paper puts forward the enterprise knowledge development (EKD) framework. EKD is based on the confluence of two technologies:

- Enterprise Knowledge Modelling and
- Process Guidance.

The term 'enterprise knowledge modelling' refers to a collection of conceptual modelling techniques for describing different facets of the organisational domain (e.g., the business processes, structures and work roles, and flow of information)

as well as the rationale behind these operations [Bubenko 1994; Loucopoulos and Kavakli 1995; Loucopoulos and Kavakli 1997; Yu 1994].

The term 'process guidance' concerns the process followed by change engineers to deal with organisational change in the change management domain. Work on process guidance is based on the process modelling paradigm in software engineering [Curtis et al 1992; Dowson 1994; Lonchamp 1994]. Research in this area mainly focuses on prescriptive models that enforce rules and behavioural patterns, which, if followed, would lead to the desired process performance. Process enforcement tries to ensure a specific sequence of tasks during the process. However, due to its social, creative nature organisational change cannot be fully prescribed. To this end, process guidance does not dictate which task should be performed next, but provides a set of applicable tasks that can be dynamically selected depending on the enactment context of the process [Grosz et al 1997; Pohl 1996; Rolland 1998; Rolland & Plihon 1996].

Process support in EKD is based on the notion of a methodology roadmap. This roadmap contains a panel of method-specific intentions and associated guidelines for operationalising these intentions. The map is a navigational structure which supports dynamic selection of the intention to be achieved, thus providing a flexible tool for guiding change processes.

This paper is organised as follows. Section II introduces the EKD framework for modelling organisational change. Section III discusses methodological issues in using the EKD framework and demonstrates one such approach with the use of an industrial case study. Finally, section IV concludes the paper with a set of observations on our experiences with the use of the approach.

## II. THE EKD FRAMEWORK FOR MODELLING OF ORGANISATIONAL CHANGE

### OVERVIEW

The objective of EKD is to provide a systematic approach to developing and documenting enterprise knowledge, thereby helping organisations to develop schemes consciously for implementing changes. To be able to model systematically and ultimately improve the change process, a framework is necessary that will enable the understanding, analysis, and tracing of the decisions involved. Research in the area of organisational reform [Morton 1991; Scherr 1993; Smith and Browne 1993; Vidgen et al 1994; Yu 1994] suggests that modelling of organisational change encompasses the following concerns:

1. The concern of understanding the current enterprise situation:

Any type of change whether it involves the development of a computerised system or the re-engineering of business processes involves many assumptions about the embedding enterprise domain. As discovered empirically [Yu 1994], poor understanding of the domain is a primary cause of project failure. To obtain a deep understanding about an enterprise, one needs to understand the current goals of the enterprise and how these goals are achieved through the involvement of organisational actors in enterprise processes.

2. The concern of exploring change from the different perspectives of the interested parties:

The need for change is typically stated simply, sometimes called the change vision. However, even if the primary goal for change is given, it does not reflect the way the need for change is understood by the enterprise stakeholders or the way change is contextualised in the particular enterprise situation. Such understanding requires the articulation of the change concept in the context of the enterprise and its social

environment and the deployment of these change goals in terms of appropriate changes of current enterprise structures and processes.

3. The concern of designing the future enterprise situation:

Change goals form the requirements upon which the re-engineered enterprise structure will be based. This task concerns the mapping of change requirements onto a future enterprise model, which in turn involves the modelling of the future enterprise goals and how these goals will be realised in terms of operational enterprise components.

4. The concern of evaluating enterprise models against the criteria of the parties involved:

The above issues concern the formulation of distinct enterprise models with respect to the current, change and future enterprise states. The aim of evaluation is to deliver an enterprise model, which is consistent with the stakeholders' experience and/or expectations. Often, alternative enterprise models may be possible (e.g., there may be multiple change models, leading to alternative future solutions). The appropriateness of a model depends on a number of criteria (termed evaluation goals) both qualitative and quantitative in nature. Such criteria are not pre-existing but need to be defined within the context of the particular change application.

Summarising, it is possible to make the distinction among four different enterprise knowledge models with respect to organisational change, namely:

1. knowledge about the current enterprise goals and how they are achieved through the current enterprise behaviour (As-Is model);
2. knowledge about the stakeholders' change goals and how they can be satisfied in terms of alternative change scenarios (Change model);
3. knowledge about the desired enterprise situation, i.e., future enterprise goals and how they are achieved by the re-engineered enterprise behaviour (To-Be model); and
4. knowledge about the stakeholders' evaluation goals concerning the appropriateness of an enterprise model (Evaluation model).

These four types of enterprise knowledge correspond to four distinct knowledge states within the organisational change 'life-cycle', namely:

1. the As-Is model defined state,
2. the Change model defined state,
3. the To-Be model defined state; and
4. the Evaluation model defined and enterprise model evaluated state.

For simplicity we refer to these states as As-Is, Change, To-Be and Evaluation state respectively. Thus, modelling of organisational change can be seen as the systematic progression through the four knowledge states. This progression is based on reasoning about the corresponding of enterprise knowledge.

For example, in a business process re-engineering project one may start by understanding the current situation (reach the As-Is state) and proceed with exploring alternative change scenarios (reach the Change state), continuing with the evaluation of alternative scenarios (reach the Evaluation state) and finally, design the re-engineered business processes according to the selected change plan (reach the To-Be state). Alternatively, one might start with the analysis of current problems and the setting of corresponding change requirements (reach the Change state) then proceed by designing the new enterprise models that satisfies these requirements (reach the To-Be state) and finally, evaluate alternative designs (reach the Evaluation state). This view of change modelling is adopted in the EKD framework illustrated in Figure.

Based on this framework, modelling of organisational change in EKD is achieved through the use of:

- a common set of concepts for describing enterprise knowledge regarding organisational change, i.e., the EKD enterprise ontology and
- a methodology roadmap and associated guidelines for assisting user navigation within the space of the possible routes connecting the four knowledge states illustrated in Figure 1.



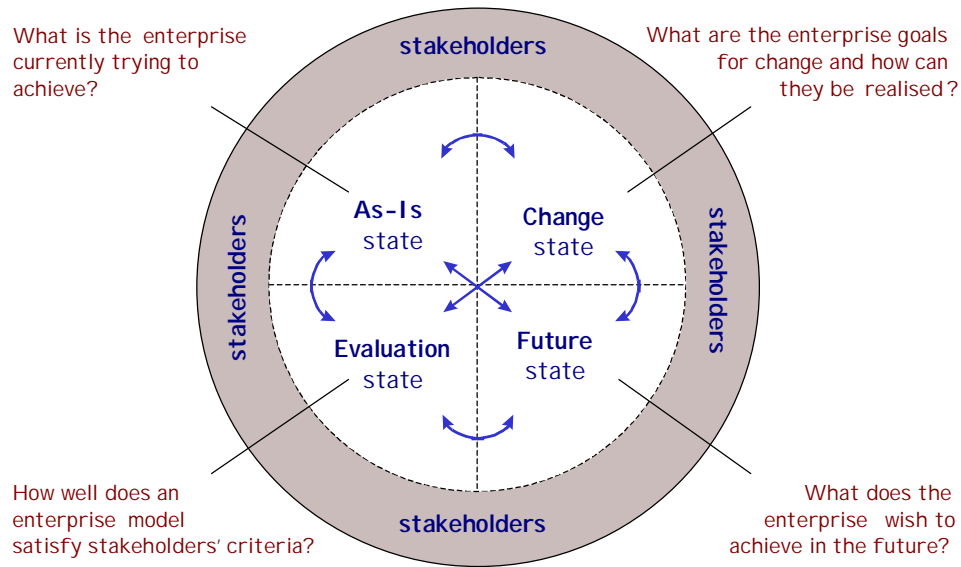


Figure 1. The EKD Framework for Modelling Organisational Change

## THE EKD ENTERPRISE ONTOLOGY

The EKD enterprise ontology [Loucopoulos and Kavakli 1997; Loucopoulos, Kavakli, et al. 1997] provides the conceptual modelling framework for describing knowledge regarding the four knowledge states illustrated in Figure 1. To this end, the EKD enterprise ontology integrates two complementary views (or submodels), namely: the enterprise goal view, and the enterprise process view as depicted in Figure 2.

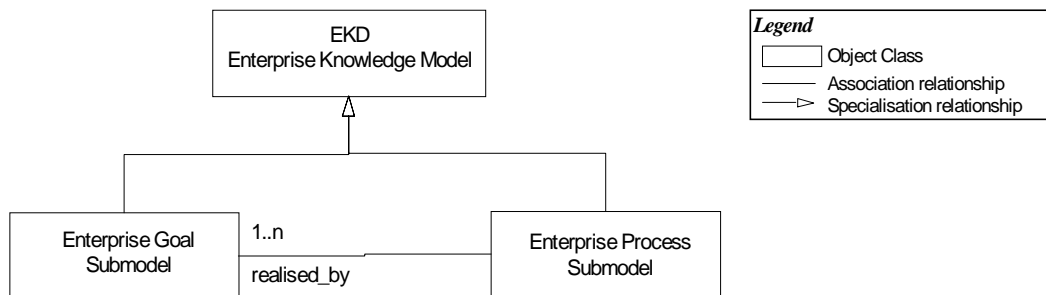


Figure 2. Enterprise Knowledge Modelling in EKD

Figure 2 describes the EKD ontology constructs using the Unified Modelling Language class diagrams [Booch, Rumbaugh, et al 1998]. A class (denoted by a box) is the descriptor for a set of objects with similar structure, behaviour and relationships, whilst a relationship represents a logical link between two or more object classes.

The EKD goal submodel uses a 'network' of goals to express the causal structure of an enterprise, in terms of the ends-means relations from the 'intentional' objectives that control and govern the system operation to the actual 'physical' enterprise processes available for achieving these objectives. The EKD enterprise process submodel represents the behavioural aspects of an organisation in terms of the roles that are played collaboratively by enterprise actors to operationalise the enterprise goals, and the dependencies between these roles.

Using the EKD ends-means links, change in enterprise goals (regarding for example, company objectives, policy, general market condition) will propagate top-down as reasons or requirements for re-organising the enterprise processes. On the other hand, changes in the physical basis of the enterprise (e.g., technological advances, improved ways of working), will propagate bottom-up, indicating how new operational conditions affect the organisational objectives.

## **THE EKD METHODOLOGY ROADMAP**

The EKD framework for modelling organisational change (shown in Figure 1) defines the set of applicable knowledge states that need to be reached in an organisational change project. However, it does not dictate any particular ordering between these states, i.e., there is no unique route for navigating the EKD framework. Instead, each state to be reached is dynamically selected in the course of the change management process. Each route characterises a specific method for solving the problem at hand. A 'step' in a route constitutes a method fragment and expresses the intention to reach state  $S_j$  starting from a source state  $S_i$  using a method-specific strategy.

The objective of the EKD methodology roadmap is to guide project participants in navigating the EKD framework. To this end, it embodies several routes thus, taking advantage of the contributions of different methods. Therefore, the roadmap is a multi-method model. In particular, the EKD methodology roadmap consists of a number of method fragments each of which is a triplet  $\langle S_i, S_j, Str_{ij} \rangle$ , whereby  $S_i$  and  $S_j$  are knowledge states and  $Str_{ij}$  is a method-specific way for reaching state  $S_j$  from state  $S_i$  (see Figure 3).

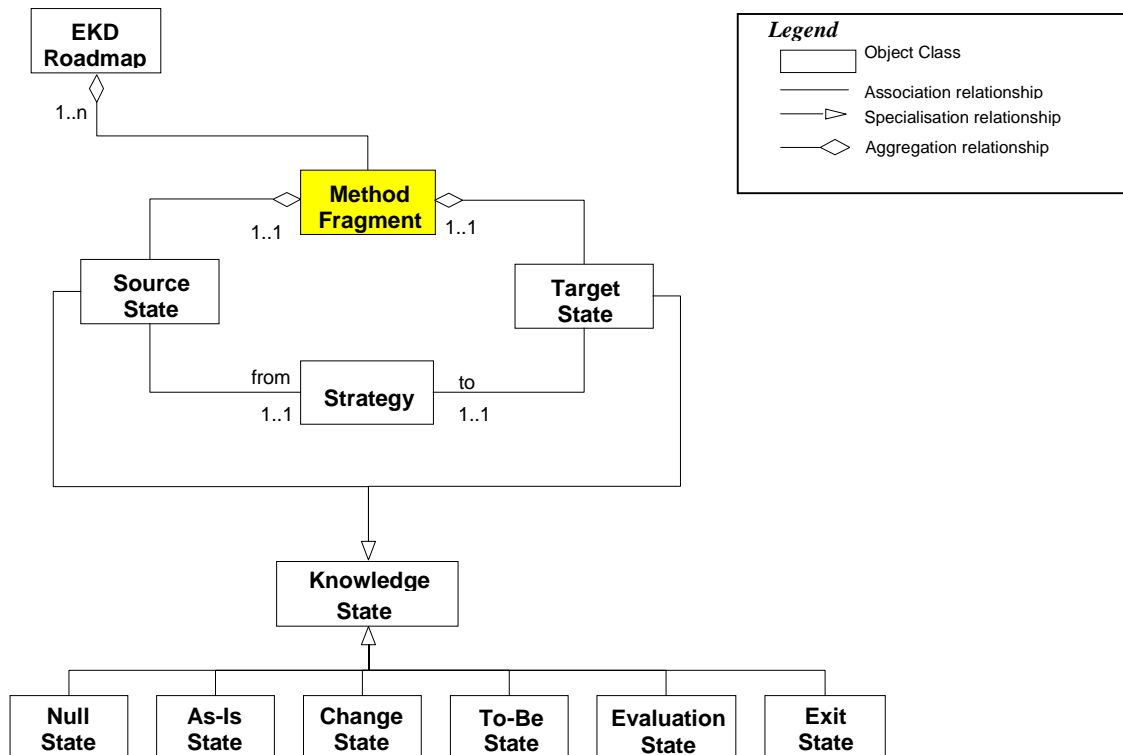


Figure 3. The EKD Roadmap Meta-model

In addition to the four states described in the EKD framework shown in Figure, two additional states are included, called Null and Exit. These describe the state where no knowledge about the enterprise is available and the state that

'enough' knowledge has been obtained, respectively. Thus, it can be seen that there are a number of routes in the roadmap from Null to Exit.

A strategy constitutes the approach, the manner in which a transition between two states can be achieved. The strategy, as part of the triplet  $\langle S_i, S_j, Str_{ij} \rangle$  characterises the flow from  $S_i$  to  $S_j$  and how this transition can be achieved.

The complete EKD roadmap is shown in Figure 4. It contains nine strategies (represented by rectangles) connecting the six states in the organisational change life-cycle (represented by circles). These strategies are based on well-known methods as well as our own experience from a number of industrial projects. As shown in the Figure 4, several method fragments may be enabled at the same time (i.e., method fragments  $\langle \text{Null}, \text{As-Is}, \text{reverse analysis strategy} \rangle$  and  $\langle \text{Null}, \text{Change}, \text{problem analysis strategy} \rangle$ ). In addition there might be several ways to reach a target state  $S_j$  from a source state  $S_i$ , each corresponding to a specific way-of-working. For example, in order to reach Change state from Null state one can either apply the problem analysis strategy directly, or go through the intermediate As-Is state.

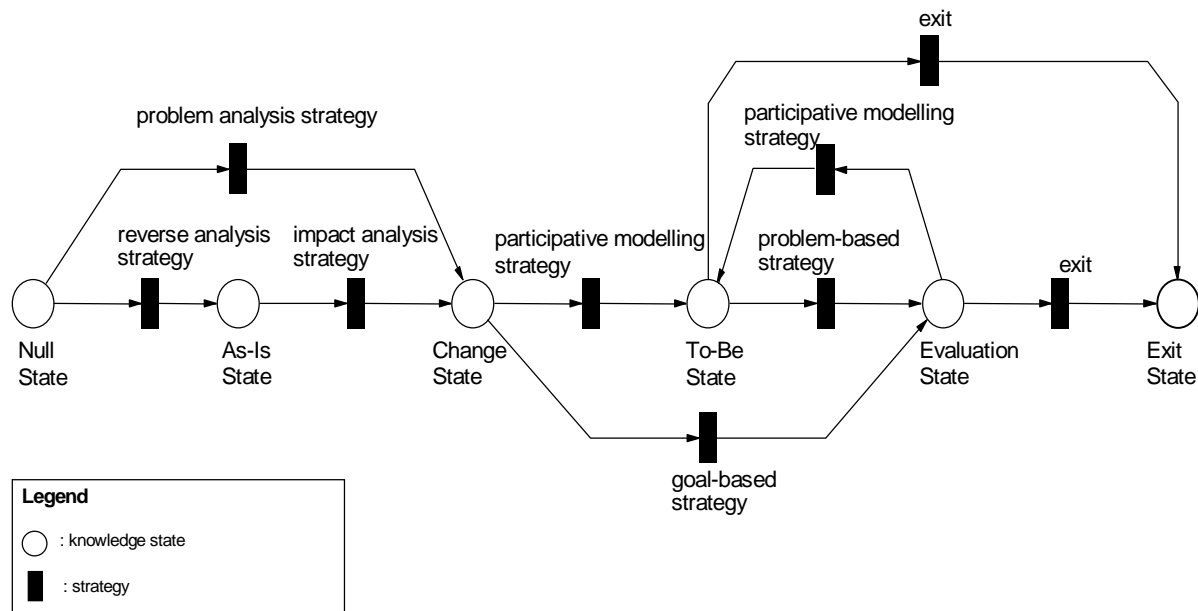


Figure 4. The EKD Roadmap

The EKD roadmap is a navigational structure in the sense that it allows the roadmap user to determine their route between the different knowledge states regarding organisational change. None of the routes included in the roadmap is recommended 'a priori'. Instead the approach suggests a dynamic construction of the actual path by navigating in the roadmap. In this sense the approach is sensitive to the specific situations as they arise in the process.

Like any ordinary map, navigation of the EKD roadmap may start at any state, depending on the organisational knowledge assumed. For example, if the user has no knowledge about the organisation then the entry point will be the Null state (as is the case in Figure 4). Alternatively, if one has enough information about the current organisational state then the As-Is state might be an appropriate entry state.

Application of the selected strategies is facilitated by the use of guidelines associated to each method fragment. A guideline provides a description of the process that should be followed by process participants to carry out a particular strategy. In this sense, a guideline embodies method-specific knowledge.

### **III. APPLICABILITY OF THE EKD FRAMEWORK IN ELECTRICITY DE-REGULATION**

The work presented in this section is part of a large industrial application that concerns de-regulation of a large European electricity company, with particular focus on the company's Distribution Business Unit, responsible for the delivery of electricity to consumers and the merchandising of electricity services.

Currently the company operates as a total monopoly. However, in anticipation of the opening of the European electricity market, the company is in the process of re-designing its business structures and planning reforms for the future, in order to increase its competitiveness and retain its market share. This is especially critical in the Distribution Unit, which is the interface of the company with the final customer.

The implications of these forces on this organisation is that, prior to designing new business processes and support information systems, any reform requires a clear understanding (and a sharing of this understanding among many stakeholders) of the current enterprise situation. However, within this company there was a lack of up-to-date documentation describing how business processes are currently being performed or what were the objectives that resulted in this way of operation. With the Distribution services having officially remained unchanged over a very long period of time, corporate memory about the rationale for the way that Distribution functioned had been lost.

This situation provided the context within which a particular way-of-working was adopted. This way-of-working corresponds to one of the possible routes accommodated in the EKD roadmap referred to as the change analysis route and is illustrated in Figure 5. Rather than proposing a future organisational structure, the objective of this route was to assist Distribution stakeholders in understanding the available alternatives for transforming the organisation.

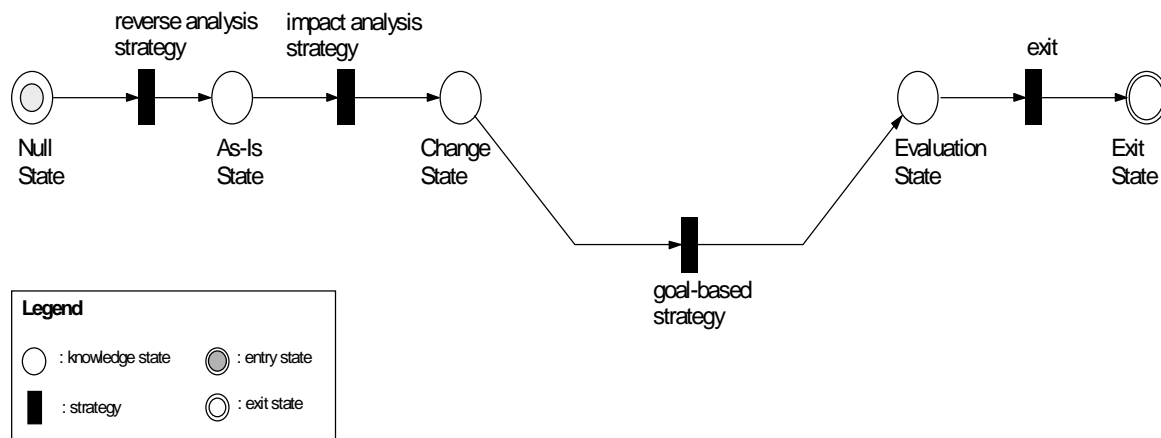


Figure 5. A Suggested Route for Change Analysis

In particular, we began by discovering the current situation before proceeding to defining the needs for change. Subsequent analysis of the impact of change needs on the Distribution organisational structure gave rise to an

extensive number of alternative scenarios for implementing change. Determination of a preferred alternative involved the evaluation of alternative scenarios against stakeholders' criteria. Based on these evaluations, recommendations were made concerning the choice of the most suitable scenario thus assisting the decision making process. In terms of the EKD roadmap, this particular route is detailed in Table 1.

Table 1. Overview of Suggested EKD Route for Change Analysis

<b>MF1 -</b>	<Null, As-Is, reverse analysis strategy>
	Produces a description of current enterprise situation, in terms of what the enterprise currently wishes to achieve.
<b>MF2 -</b>	<As-Is, Change, impact analysis strategy>
	Deliberates on the need for change and analyses the impact of change requirements on the hierarchy of current goals thus producing alternative change scenarios.
<b>MF3 -</b>	<Change, Evaluation, goal-based strategy>
	Identifies a number of evaluation criteria and assesses the appropriateness of alternative change scenarios.
<b>MF4 -</b>	<To-Be, Exit, exit>
	Suggests a preferred scenario based on the interpretation of evaluation data and completes the change analysis route.

In the remainder of this section we describe each of the method fragments illustrated in Table 1 giving also a brief account of the results.

### **DISCOVERING THE A S-IS STATE (Method Fragment MF1)**

As can be seen in Figure 5, the first step in this route constitutes the discovery of the current enterprise state (i.e., reaching the As-Is state). This step is performed in a descriptive manner, whereby knowledge about the current organisational goals is abstracted from current practice. This descriptive way of working corresponds to the method fragment MF1-<Null, As-Is, reverse analysis strategy> in the EKD roadmap.

Following the guidelines encapsulated in the roadmap, first the conceptualisation of current enterprise processes was carried out by EKD analysts, using a number of knowledge sources including interviews with business experts, questionnaires completed by business experts, existing literature relevant to the business domain, documentation of existing systems, etc. Second, the goals realised by existing processes were abstracted from the process descriptions thus establishing the connection between the current enterprise purpose and behaviour [Kavakli and Loucopoulos 1998].

Analysis of Distribution processes uncovered three classes of business processes namely

- district,
- region and
- central service

provision processes. These processes are collectively responsible for performing Distribution activities. Reasoning about these processes and their 'private' goals resulted in the identification of the overall organisational goal hierarchy, which demonstrates the over-all purpose of the current setting of Distribution. A partial view of the over-all Distribution goal hierarchy is represented graphically in Figure 6. Leaf goals in this hierarchy are operational goals corresponding to specific enterprise processes. Higher-level goals were abstracted from these operational goals based on their intentional affinities.

Figure 6 demonstrates how different processes collectively support the realisation of higher-level enterprise goals. For example, the 'electricity supply application fulfilment' and the 'failure restoration' processes both (ultimately) support the enterprise goal to 'serve efficiently customer requests'. The two processes respond to different types of requests and are serviced by different Distribution departments. They are described as different processes by Distribution personnel. However, modelling of enterprise goals revealed that they both are components of the same macro-process, which deals with customer servicing.



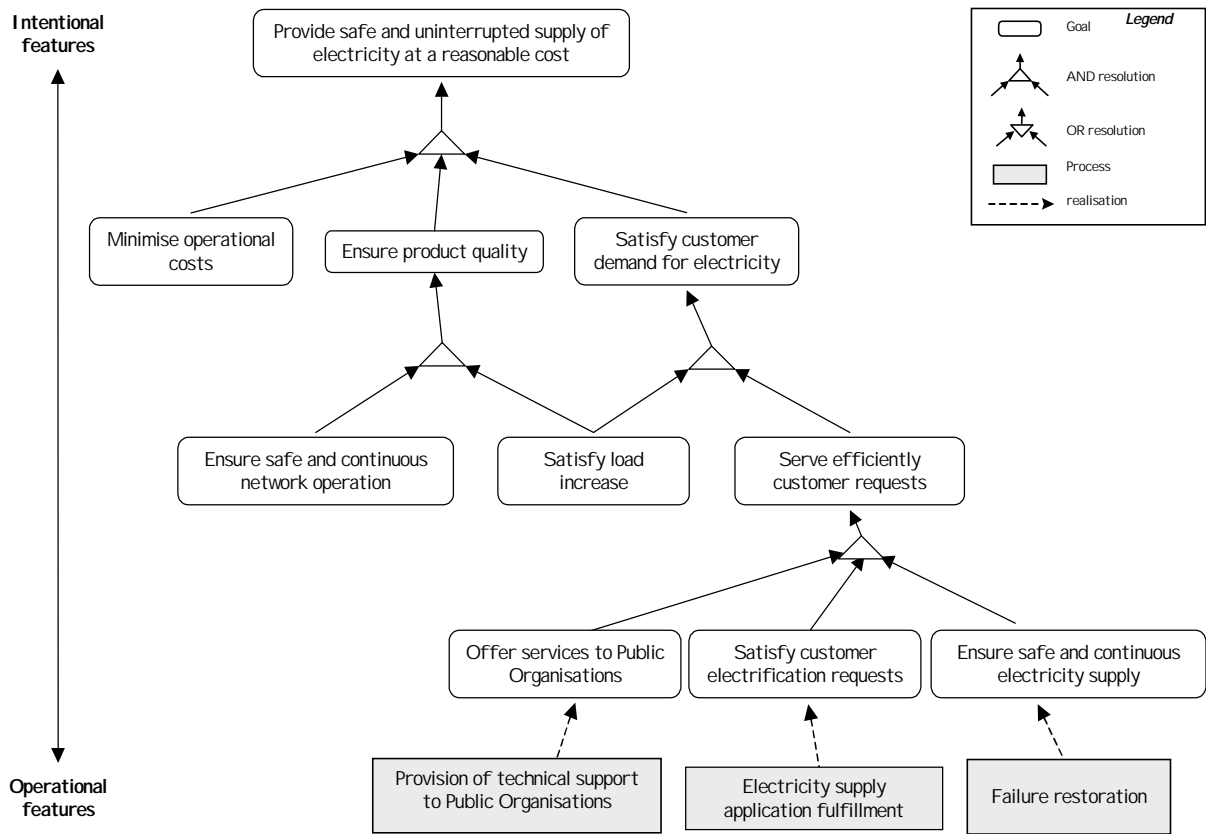


Figure 6. Current Distribution Goal Hierarchy

An additional advantage, therefore, of explicitly modelling enterprise goals was that it assisted the logical organisation of business processes into a few core processes according to strategic business goals. This contributed to a process-centred orientation of the enterprise, putting emphasis on ‘global’ objectives rather than ‘internal’ goals of individual processes.

### **IDENTIFYING ALTERNATIVE CHANGE SCENARIOS (Method Fragment MF2)**

Identifying alternative scenarios for change was conducted using an impact analysis approach as indicated in the method fragment MF2-*<As-Is, Change, impact analysis strategy>*. This approach focuses on the systematic analysis of the effects of change requirements on the existing enterprise context,

rather than prescribing a solution based on experts' opinions [Loucopoulos et al 1998].

The stakeholders were involved in co-operative sessions with the aim of developing a shared understanding of the current problems and future organisational threats and opportunities. These sessions resulted in the specification of both internal enterprise needs as well as external constraints that defined the enterprise change requirements.

This task was assisted by the use of Ventana GroupSystems© [Ventana-Corporation 1994]. GroupSystems is a suite of team-based decision software tools that were used for the identification, elaboration and resolution of stakeholder requirements. By engaging in such activities, the participants managed to agree on a number of critical issues relating to the re-organisation of Distribution. The identified change requirements were extensively discussed and rationalised in a process that necessitated several sessions involving both strategic and operational Distribution personnel. An example of the requirement elaboration activity using the GroupSystems software tool is shown in Figure 7.

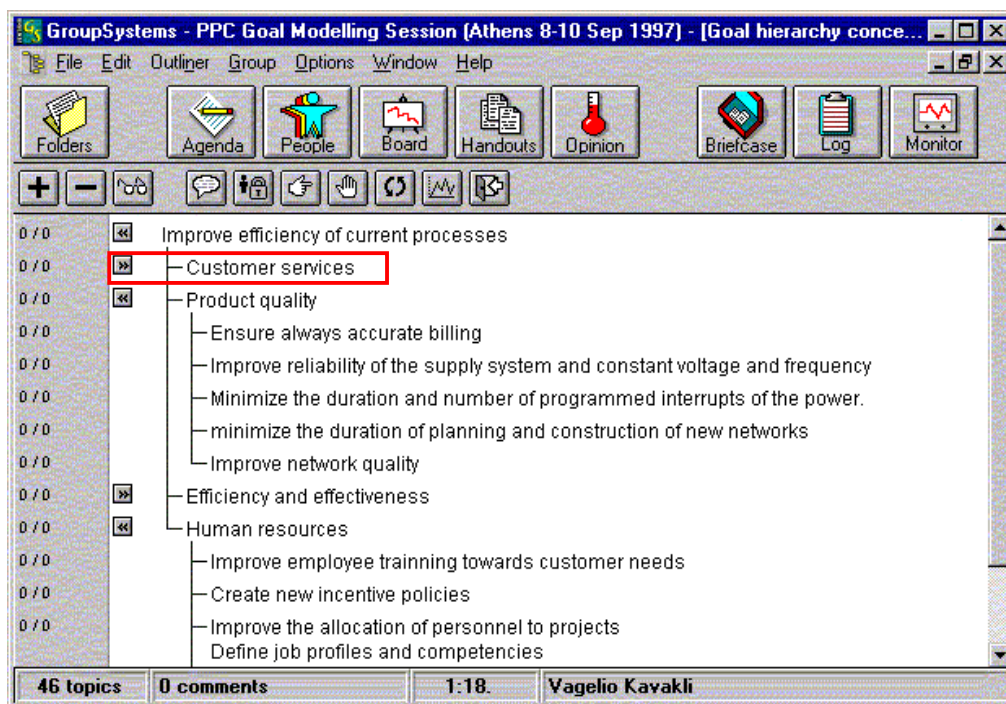


Figure 7. Refining Future Distribution Change Requirements

Having agreed on a set of change requirements the next step in our route was to identify how these requirements could be compared and contrasted with the current goals, thus providing a basis for a reasoned approach for future improvement. This task resulted in the identification of alternative change scenarios indicating the type of organisational transformation necessary for satisfying change requirements.

To illustrate, consider the future Distribution requirement 'improve customer services' highlighted in Figure 7. Servicing its customers is obviously not a new goal for Distribution. Indeed one of its current high-level goals is to 'serve efficiently customer requests'. Thus, satisfying of the future goal 'improve customer services' will clearly impact the way the current goal 'serve efficiently customer requests' is realised.

In particular, Distribution personnel identified two types of impact: to improve/adapt the current way of realisation or to introduce a new intelligent front desk. These two alternatives 'improve current practices' and 'introduce intelligent front desk' are two alternative refinements of the future requirement 'improve customer services' as shown in Figure 8. These two alternatives give two major branches in the Distribution change model each corresponding to an alternative scenario for change:

- scenario (A) 'improve customer services by introducing intelligent front desk' and
- scenario (B) 'improve customer services by improving current practices'.

### **EVALUATING ALTERNATIVE SCENARIOS (Method Fragment MF3)**

Selection of an optimal change option was carried out through comparative evaluation of alternative scenarios incorporated in the change process model. This evaluation corresponds to the method fragment MF3-  
<Change, Evaluate, goal-based strategy>, which leads to the Evaluation state in the EKD roadmap.

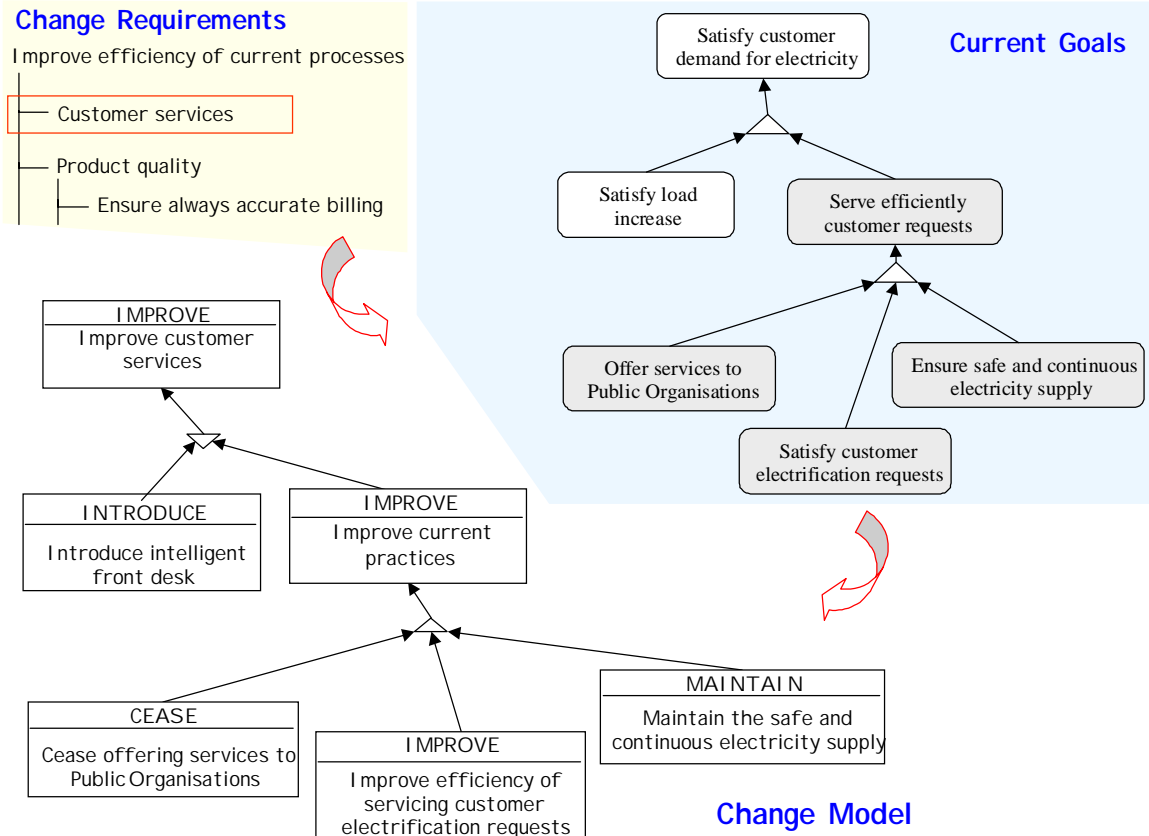


Figure 8. Constructing the Distribution Change Model

Following the guidelines associated to the goal-based strategy, comparative evaluation of alternative change scenarios in the Distribution case was performed in co-operative sessions based on a number of evaluation goals identified by Distribution personnel. During these sessions participants were asked to mark each scenario with respect to each evaluation goal in a nominal scale from Very Low to Very High. Before the actual voting, a discussion took place to clarify the meaning of evaluation goals. The result of the evaluation of the scenario (A) 'introduce intelligent front desk', introduced in Figure 8, is illustrated in Table 2.

Table 2 . Evaluation of Scenario A against Evaluation Goals

<b>Scenario A:</b>	Improve customer services by introducing intelligent front desk								
<b>Description:</b>	The change will involve improvement of and where needed, redesign of service processes and supporting IT systems. The implementation comprises introducing customers profiling, minimising delay time to serve an application, offering all means for payment, offering all services at customer premises, introducing all available technologies to communicate with customers, introducing IT solutions for all services.								
<b>Evaluation Goals</b>	<b>NA (0)</b>	<b>Very Low (1)</b>	<b>Low (2)</b>	<b>Average (3)</b>	<b>High (4)</b>	<b>Very High (5)</b>	<b>Total</b>	<b>STD</b>	<b>n</b>
<b>Feasibility to deliver in the given time frame</b>				1			6	.82	
<b>Added Value</b>				1			6	.82	
<b>Cost</b>				3			4	.00	
<b>Balance of concerns</b>				1			6	.82	
<b>Product Quality</b>				2			5	.96	
<b>Productivity</b>				3			4	.00	
NA = Not Applicable STD = Standard Deviation n = number of participants									

The aim of the co-operative evaluation sessions was to assess the level of agreement among the different Distribution stakeholders regarding the validity of individual scenarios as well as the comparative evaluation of antagonistic scenarios. When the level of agreement between participants was low then the evaluation was repeated following a discussion aiming to identify conflicting views and clarify possible misunderstandings of the situation.

## **SUGGEST A PREFERRED SCENARIO (Method Fragment MF4)**

The final step in this route concerns the suggestion of a preferred scenario based on the evaluation results, thus reaching the Exit state as indicated in this final fragment MF4-<Evaluation, Exit, exit>.

A number of problems were attributed to the interpretation of the evaluation data regarding alternative change scenarios in Distribution. First, there was no single evaluation goal for assessing change scenarios. In fact change scenarios had to satisfy a number of evaluation goals both qualitative and quantitative in nature such as cost, product quality, and feasibility to deliver in a given time frame. Second, different evaluation goals were not equally important. For example, there were cases that product quality was considered more important than cost whilst there were situations that the opposite applied.

Moreover, there was no clear relation between different criteria. For example, it was not possible to define that product quality weights twice as much as cost, or that productivity of services is twice as important as the feasibility to deliver services in a given time frame. Thus, a scenario could get a high average marking but still be unsuitable if it was given a low mark with respect to evaluation goals of strategic importance for the organisation. Ranking the evaluation goals with respect to their relative importance to the organisation proved to be of assistance.

In conclusion, both scenario evaluation as well as interpretation of evaluation data was dependent on subjective judgement of involved participants. Finally, it should be noted that the evaluation data provided organisational stakeholders with a rationale means of making an informed choice. The choice was ultimately that of the key personnel concerned with change and although this is outside the scope of evaluation per se, nevertheless, one should be aware of the political, social and organisational factors that affect the final choice.

## IV. DISCUSSION AND FUTURE WORK

This paper reports on the use of an intentional framework for modelling organisational change. Current approaches generally view change management as a top-down process. Such methods (e.g., BPR approaches) assume that the change process starts with a high level description of the business goals for change. These descriptions constitute a very abstract representation of the future reality at the intentional level. The initial goals are then put into more concrete forms during the process, progressively arriving at the specification of the future system requirements that satisfy these goals. Other approaches (e.g., TQM) advocate a bottom-up orientation whereby the need for change is discovered through analysis of the current organisational situation and reasoning about whether existing business structures satisfy the strategic interests and concerns of the involved stakeholders.

In the first case the goals for change are prescribed in the sense that they do not explicitly link the need for change to the existing organisational context, rather they reflect how change is perceived from the strategic management point of view or is codified in the organisation's policies and visions. Therefore, such goals do not always reflect reality [Anton 1996]. On the other hand, in bottom-up approaches goals for change are described i.e., they are discovered from an analysis of actual processes. However, descriptive goals tend to be too constrained by current practice, which can be a serious drawback especially when business innovation is sought [Pohl 1996].

This paper presents an iterative approach that integrates the two views, namely the EKD approach. This approach describes change both in terms of understanding the current situation and designing future situations. Change management is viewed as the process of discovering business goals for change and analysing the impact that these goals have to existing business structures and practices. The process is facilitated by the use of a navigation roadmap and associated guidelines. A major advantage of the proposed approach is the systematic way of dealing with change in terms of enterprise knowledge modelling used with a process guidance framework.

The application of the EKD approach to the Distribution application presented a number of challenging features:

- the uncertainty of the initial situation,
- the existence of multiple often interfering goals,
- the need for multi-agent co-operation and communication.

These contributed to a large space of alternative decisions to be made throughout the change analysis process and highlighted a number of organisational factors that can affect the application of knowledge modelling strategies. These include:

1. organisational culture, e.g., organisational actors that were not used to working in groups in a participative way, felt awkward in such a situation and found it difficult to contribute as intended;
2. ability to commit resources, e.g., the quality of the knowledge models largely depended in the participation of the 'right' people both in terms of business experts and method experts;
3. social skills and consensus attitudes of participating actors, e.g., conflicts between individuals and groups within the project increased the complexity of the situation;
4. use of software tools to facilitate the process execution, e.g., the use of group support technologies in participative sessions increased both productivity and the quality of results obtained; and
5. familiarity with applied strategies and supporting technologies, understanding, among project participants, of the capabilities and limitations of the strategies and tools applied was vital in order to make the best use of them and to produce useful results.

These observations were used to revise and enhance the guidelines provided by the EKD roadmap.

## **FUTURE WORK**

Future work concerns the continuous refinement and enhancement of the approach based on its application to different organisational situations in several



domains. Our aim is to enhance the particular features of the framework in terms of:

1. refining and extending the content of the EKD roadmap by adding new strategies for reasoning about enterprise knowledge;
2. improving the associated guidelines by incorporating practical experiences; and
3. identifying possible project contingency factors that can determine the applicability of method fragments as well as the suitability of particular routes in different application domains, thus leading to the development of 'best-practice' knowledge;

In addition to the conceptual framework described in this paper, technological support to managing organisational change is needed. To this end we developed a prototype of an [electronic EKD roadmap navigation tool](#). This prototype is based on World Wide Web (WWW) technology. The advantages of this medium include the extensive use of WWW browsers for presenting information, as well as the fact that it directly supports the handling of distributed information. Thus, the electronic roadmap can be used by different users at different sites in the organisation.

The current EKD roadmap navigation prototype focuses on user interface issues (e.g., web page design, information presentation, manipulation and navigation). Our future plans include the addition of new features for addressing user needs. Indeed, experience with this prototype has shown the need for allowing the customisation and extension of the routes and guidelines provided by the roadmap. For example, users should be able to add new strategies or annotate existing guidelines by adding their personal tips, comments and remarks.

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