Goal-Oriented Decomposition of Event-Driven Process Chains with Value Focused Thinking

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Abstract

There is agreement in business modelling literature that decomposition of business processes should be guided by business criteria. However, there is little guidance as to how this should be achieved. Depending on the purpose of the business model, business criteria may refer to business analysis needs, documentation of business processes, allocation of resources, fulfilment of business objectives, etc. Although each of these criteria is important, the need for business processes to fulfil business objectives is paramount to the overall success of the business. In this paper we extend existing research on the relationship between business objectives and process modelling by proposing a conceptual model and implementation guidelines for process decomposition using business objectives as the guiding business criteria.

Keywords

Process Modelling, Process Decomposition, Objectives, Decision Analysis, EPC

INTRODUCTION

Neiger & Churilov (2002) identified the need for tighter integration between process and decision modelling and proposed a conceptual model that integrates both of these approaches by linking the common elements being the function, objective and information. The model for linking objectives proposed by Neiger & Churilov (2003, p. 85) "facilitates the integration of strategic, decision and process objectives within the single framework" that is required in order to achieve overall objectives of the business. However, this model provides little guidance for developing a goal-oriented process model. This paper intends to close this gap by:

- developing a conceptual model for application of decision analysis to goal-oriented process modelling; and
- suggesting guidelines for implementation of this model in a real-life business scenario.

Consistent with the previous application of decision analysis methodology to process modelling, we will limit our discussion of process models to the event-driven process chain (EPC). This EPC approach to process modelling has been successful in "real-world application" (Scheer, 1999, p. 20) and can be easily related to other modelling approaches such as object-oriented, UML, and Petri-net (Green & Rosemann, 1999, Loos & Allweyer, 1998, Nuttgens et al 1998).

The remainder of the paper is structured as follows. In the Background section, the "value-focused thinking" methodology and process modelling decomposition rules are introduced. This is followed by a brief review of the goal-oriented process modelling literature. In the Conceptual Model section, a goal-oriented model for process decomposition is proposed using decision analysis tools. A step-by-step procedure for the application of the model in business process modelling context is introduced and discussed in the Implementation Guidelines section. The paper is concluded with the discussion of benefits and limitations of the proposed model.

BACKGROUND

To avoid any confusion, which may result from ambiguities associated with the term "process modelling", we refer to process modelling as "documentation, analysis and design of the structure of business processes, their relationship with the resources needed to implement them and the environment in which they will be used" (Davis, 2001 p. 2). Thus, for the purpose of this paper, we are primarily concerned with process modelling from the perspective of developing new processes or improvement to current processes (Hurri, 2000, p. 8) rather than product or technological developments.

It is also important to clarify the use of terms “goal” and “objective”. The terms *goal* and *objective* are generally used interchangeably within the process-modelling field. However, within classical decision sciences, the term *objective* is a more accepted term for “a statement of something that one desires to achieve” (Keeney, 1992). In the context of the paper, both terms refer to this concept of objective. We generally use the term *goal* in the context of process modelling discussion, the term *objective* is used in the context of decision analysis methodology, and either term may be used in a general business-modelling context.

In this section, we introduce two key methods required for understanding of decision analysis approach to goal-oriented decomposition of process models represented as EPCs. Firstly, the “value-focused thinking” framework is introduced to describe a classical decision analysis approach to goal modelling. Then, an EPC is defined and used as a context to discuss process decomposition concepts and rules.

Value-focused thinking framework

Similarly to other goal modelling frameworks, the motivation for development of the framework for structuring objectives in classical decision analysis lies in the realisation that business modelling is successful only when business goals (linked to business beliefs and values) are understood and are the primary driving force for the model (Keeney, 1992, 1994, Regev & Wegmann, 2002). The “value-focused thinking” framework developed by Keeney (1992) was created to address concerns that the technical nature of decision models originating from the operations research resulted in very narrow and specific modelling goals that didn’t necessarily address overall business requirements. To overcome this limitation, Keeney (1992) proposed methodology for the identification and structuring of business objectives by focusing firstly on the fundamental values of the business and then, on the means of achieving these values. A fully decomposed “value-focused thinking” framework of objectives ensures that individual decision modelling (and other) objectives are ultimately linked to the fundamental business objectives through the means-ends network and the hierarchy of fundamental objectives. As well as ensuring that individual objectives are linked to the overall business objectives this approach facilitates identification of conflicting objectives and development of value trade-offs required for quantitative decision modelling (Neiger & Churilov, 2002).

Within the “value-focused thinking” framework the fundamental objectives are organised into a hierarchy by asking the questions “Of what more general objective is this an aspect?” and “What do you mean by that?” to move to and from (respectively) the ultimate end(s) that “decision makers value in a specific decision context” (Keeney, 1994, p. 34). The means objectives are defined as the “methods to achieve ends” (Keeney, 1994, p. 34) and are structured as a means-ends objectives network (Clemen & Reilly, 2001, Keeney, 1994) by asking the question “How can you achieve this?” or “What will make this happen?” to move away from fundamental objectives, and “Why is this important?” or “What will this result in?” to move towards fundamental objectives.

Within the means-ends network framework individual objectives are not required to have a direct link to the specific fundamental objectives that they aim to achieve. It is sufficient to establish that the means objectives together achieve the fundamental objectives. Furthermore, since the means-ends network is not a strict hierarchy it allows lower level (subordinate) means objectives to contribute to more than one level of the higher-level means objectives. This approach removes artificial constraints imposed by the hierarchical structure on the relationship between different types and levels of objectives, while clearly separating the abstraction relationship (represented within the fundamental objectives hierarchy) and causal relationships (represented within the means-ends objectives network) (Hurri, 2000, p. 31).

The drawback of the means-ends network, is that it implies that the higher-level objectives can only be achieved if all of the lower level objectives that are linked to it are achieved first. The possibility that a means objective may be achieved by one <u>or</u> more functional objectives is not explicitly represented within the network. A conceptual model that aims to synchronise decomposition of objectives and processes will need to address this shortcoming.

Process Decomposition

Unlike the decomposition of objectives, which is aimed at ensuring that lower level objectives are linked to business values and beliefs, process decomposition can be motivated by many reasons. Differences in motivation could result in substantial differences between decomposition structures of a process (Davis, 2001, p. 259). Common drivers for process decomposition include clarity of activities, understanding of resource allocation (Gordijn et al, 2000), the needs of business analysis (IDS Scheer 2000), the needs to ensure that process produces the required results (Curtis et al, 1992), etc. A process model may aim to meet two or more of those needs within the same decomposition structure. Curtis et al (1992, p. 83) summarises issues involved with the decomposition structure as

"The granularity issue involves the size of the process elements represented in the model. The pressure for greater granularity is driven by the need to ensure process precision - the degree to which a defined process specifies all the process steps needed to produce accurate results. In many domains, descriptions for process scripts are presented to humans at too high a level of abstraction and they do not provide sufficient detail for guiding actual execution… If human agents do not possess sufficient process knowledge, it may be desirable to model finer-grained process steps with approaches that represent alternative steps and sequences and can encode guidance in how to choose among them."

To provide the background required for understanding of the role of goals in process decomposition, the definition of an EPC process model and guidelines for process decomposition of an EPC are discussed in this section.

Davis (2001, p. 111) defines an EPC as "a dynamic model that brings together the static resources of the business (systems, organisation, data, etc) and organises them to deliver a sequence of tasks or activities ('the process') that adds business value". Normally, an EPC model includes four types of objects: events, functions, rules, and resources. Without loss of generality and for the purposes of this paper, functional objectives borrowed from an extended EPC (e-EPC) model are included as an additional class of EPC objects to facilitate linking processes to objectives (Neiger & Churilov, 2003).

Events within the EPC represent the "changing state of the world as a process proceeds" (Davis, 2001, p. 111) and trigger functions that represent "activities or tasks that are carried out as part of a business process " (Davis, 2001, p. 112). Functions in turn produce events that become triggers for other functions resulting in a chain of events and functions (Davis, 2001, p. 113). Functional objectives are defined as well-defined goals that the function is aimed to achieve (Hammer & Champy, 1994).

Rules objects are introduced to the EPC to allow "parallel branches, decisions, multiple triggers and complex flows" (Davis, 2001, p. 118). Three logical operators are required for the definition of the rules: OR, XOR and AND. The interpretation of the operators varies slightly depending on whether they are following or preceding a function. Operators following functions indicate a decomposition of the process flow, whereas the operators that precede functions indicate decomposition of events (Davis, 2001, p. 119). Whilst event decomposition is part of process decomposition, it is not directly influenced by business objectives and therefore is not discussed further in this paper. Accordingly, whenever logical operators are subsequently discussed, they should be assumed to be following a function.

Using the EPC model to describe the process, Davis (2001, p. 229) defines two types of decomposition: horizontal *segmentation* of the EPC model into "manageable chunks which link together"; and *hierarchical decomposition* required for complex processes to enable modelling at different levels of details.

Guidelines for segmentation and hierarchical decomposition provided by Davis (2001, chapter 11) include:

- using events to link decomposed models;
- aiming to link processes within a single decomposition layer;
- limiting the number of levels within the hierarchical structure to between three and seven with middle levels representing the structure of how the business operates (i.e. processes), the high levels representing the conceptual view of the business, and the low levels used for details of specific tasks; and
- using the ratio of one function to approximately 10-30 sub-functions as a guide to the size of individual models within each layer.

However, overriding most of these guidelines is the golden rule for process decomposition (Davis 2001, p. 255) that **"if it looks sensible it *probably* is sensible – if it looks silly it *definitely* is silly!"** This rule inevitably leads to an ad-hoc and subjective approach to process decomposition. The questions such as "when the function should no longer be decomposed", "is there a business rational behind the decomposition process" and "how do we ensure that decomposed processes meet business objectives" are not answered. Statements like "elementary functions are functions which cannot be divided any further for the purpose of business process analysis" (IDS Scheer, 2000, section 4.1.1.1) and "all of them <sub-models> should be created according to business criteria" (Scheer, 2000, p. 128) are all that is available to guide the modeller in a rational decomposition of a process.

Linking functional and process objectives to an objectives hierarchy is the first step towards goal oriented process decomposition with decision analysis tools. In the next section a classification of the available methods aimed at achieving this goal is presented.

CLASSIFICATION OF GOAL-ORIENTED BUSINESS PROCESS MODELS

The role of objectives in business process modelling is the subject of an ongoing discussion in business process modelling community (GBMP, 2002). There is a universal agreement in business modelling literature that "business processes should focus on … goals" (Scheer, 2000, p. 10), however the definition and methods for identification and structuring goals are far from universal. The discussion of the relationship between goals and processes is minimal and highly segregated between various disciplines concerned with process modelling. A review of current literature on goal-oriented process modelling approaches[1] identified three distinct classes: state-based approach, requirements engineering approach and decision analysis approach. A brief overview of each class and advantages and disadvantages of the corresponding approaches are presented in this section.

State-based approach

Khomyakov & Bider (2001) proposed this approach with the aim of introducing flexibility into the rigid workflow models by starting from chaos and then "introducing some means to restrict it". This leads to representation of a process models as a "trajectory in the space of all possible states" and representation of goals as final states in the flow of a process's states. Within this context, the process can be decomposed into a set of independent sub-processes each leading to achievement of sub-goals as well as interlinked processes with one process delivering the means required by another process to achieve its goal.

The advantage of the state-based approach from the goal-oriented modelling view, is that processes and goals are tightly integrated with a clear link from one to another. The disadvantage (at least in the current form of this approach) is that the structural relationship between different levels of goals and its implication for process decomposition is not discussed.

Requirements Engineering approach

There are a variety of frameworks within requirements engineering that link goals to activities or tasks (Kueng, 1997, Mylopoulos & Castro, 2000, van Lamsweerde, 2001) which makes it impossible within the constraints of this paper to do justice to the breadth and depth of the requirements engineering discipline. van Lamsweerde (2001) and Hurri (2000) should be referred to for a review of various approaches, methodologies and applications available within the requirements engineering field. For the purposes of this paper, it suffices to say that within requirements engineering, goals are generally structured in hierarchical AND/OR reduction/refinement graphs (Haumer et al, 1998) with several classification types including functional/non-functional, soft/hard, achievement/maintenance/optimisation goal, etc.

Methodology introduced by Kueng (1997) aimed at deriving a complete set of functions (referred to as activities) from a decomposed Goal/Means-hierarchy of functional goals is used to illustrate the contribution of requirements engineering to goal-oriented business process modelling. Within this approach, a cyclical process is used in order to construct a process model from the list of functions that are initially derived from the objectives hierarchy and combined into processes with the help of Input/Output Tables that describe the inputs required and outputs generated by each function. Non-functional goals are then used to evaluate and refine the process model.

The advantage of this approach is that it ensures that each function, within the process, is focused on business goals. The main limitation of this approach is that it fails to utilise the structure within the functional objectives hierarchy in order to facilitate development of the process hierarchy structure. As a result it is unclear how decomposition of the process into various levels of detail is to be achieved or related to the goals hierarchy.

The other limitation of using AND/OR reduction/refinement graph in its current form is that the abstract and causal relationship between objectives (describing, respectively, relationship between fundamental business objectives and means of achieving them) are mixed (Hurri, 2000, pp. 31, 34). The "value-focused thinking" approach adopted within the classical decision analysis overcomes this shortcoming.

Decision analysis approach

This approach links the "value-focused thinking" framework discussed previously to the process and functional objectives at various levels of the process hierarchy with the aim of providing "a broader decision context for the EPC and linking the means and fundamental objectives to processes and functions responsible for fulfilling them" (Neiger & Churilov, 2003).

[1] Methods that discuss objectives within process context such as cause and flow diagram (IDS Scheer, 2000), critical success factors (Scheer, 2000), balance-score card (Walker & MacDonald, 2001), etc. but provide little insight (except in very general terms) into the issues of goal-oriented process modelling are excluded.

The resulting linkage model is defined by the following rules:

1) each functional/process objective can correspond to one or more function/process;
2) fundamental and process objectives are a subset of the means objectives, with business process-modelling objectives at each level of the process hierarchy forming a level within the means objectives network;
3) functional and process objectives sets do not intersect with the fundamental objectives; and
4) the links between functional/process objectives and fundamental objectives are a subset of the set of links between means objectives and fundamental objectives .

The advantage of this approach is that it provides the means for identification and structuring of process objectives while encapsulating both the abstraction and the causal relationship between the objectives (Hurri, 2000) at the level of the process and function. The direct link to decision analysis has the advantage of making available a vast library of methods for identification of objectives and linking objectives structure to optimisation, system dynamics, simulation, multiple criteria decision analysis and group decision making models – all of which can be used to ensure an effective as well as efficient business process structure (Neiger & Churilov, 2003).

While the flexible nature of the objectives network allows *many to many* relationship between functions and objectives to be accommodated, the absence of logical connectors in the "value-focused" framework makes it difficult to relate the objective structure to the multiple process paths that make up a process model. So even though this approach facilitates the integration of strategic, decision and process objectives within a single framework, it does not address the issue of synchronised decomposition between the objectives network and process hierarchy. These limitations are addressed in the next section.

CONCEPTUAL MODEL

Given the diversity of outlooks on process modelling, additional approaches towards goal-oriented process modelling will no doubt arise. Furthermore, each of the three classes discussed above is likely to be further developed and refined through practical application and research. The focus of the remainder of this paper is on a decision analysis approach towards goal-oriented modelling. In this context, the conceptual model is developed by:

- linking the process and functional objectives with the fundamental objectives of the business;
- associating logical relationships with the "value-focused" objective network to facilitate goal-oriented horizontal segmentation of a process model; and
- extending the linkage model to include the rules for synchronised hierarchical decomposition of objectives and processes.

Link between process and functional objectives and the fundamental objectives of the business

Neiger & Churilov (2003) link the "value-focused thinking" framework to the process and functional objectives as illustrated in Figure 1 for one process with two objectives and four functions with one objective each. Since process and functional objectives represent a subset of the means objectives they represent the means of achieving the fundamental objectives of the business. Therefore asking the question "How can you achieve this?" with respect to each of the fundamental objectives generates the objectives of the first process decomposition layer. These means process objectives are then decomposed into the means-ends network that includes functional objectives for each function within the process (Neiger & Churilov, 2003).

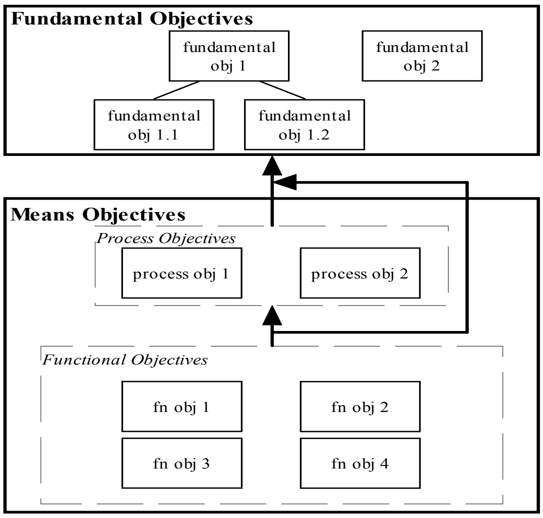

Figure 1: Linkage model adopted from Neiger & Churilov (2003, fig. 3)

For example, fundamental objectives of a sales department may be to *maximise profit* and *satisfy customers*. *Find quality buyers* could be one of the means objectives required to achieve the fundamental objective *maximise profit* therefore corresponding to one of the processes within the sales department. From a reference model or by observing the department at work, it is established that *presales activities* sub-process of the *sales* process is aimed at achieving *find quality buyers* objective. *Finding quality buyers* is in turn achieved (or caused by) fulfilling *excellent sales campaign* and *prompt follow-up of potential customers* objectives. These two objectives represent the next level of the means-ends network and would represent functional objectives for pre-sales functions *conduct a sales campaign* and *follow-up potential customers* that make-up the *pre-sales* process.

As can be seen from the above example, the relationship within the means-ends network assumes that <u>all</u> lower level objectives have to be met in order for the higher-level objective to be met. It is not clear how alternative paths e.g. if the department had a choice of a *direct mail-out* (aimed at *increasing awareness of existing customers*) and/or *increased TV advertising* (aimed at *generating new customers*) as part of its *sales campaign*, should be handled within the means-ends network.

Hierarchical AND/OR reduction refinement graphs used for goal modelling within the requirements engineering context (Haumer et al, 1998) go some way towards addressing this problem. The AND-reduction is used for links where all of the subordinate goals must be met in order for the corresponding higher-level goal to be achieved. The OR-refinement is used for links where it is sufficient for at least one of the subordinate goals to be met in order for the higher-level goal to be achieved. To further extend this structure in order to differentiate between the logical "OR" and "eXclusive OR (XOR)" relationships that can exist between goals, define OR-refinement as a set of subordinate objectives that are sufficient together or individually to meet the higher-level objective, and XOR-refinement as a set of a strictly alternative means (i.e. meeting one of the subordinate goals excludes the possibility of the other one ever being met) of fulfilling the higher-level objective.

By assigning the logical AND/OR/XOR structure to the means-ends network the "value-focused thinking" objectives framework is easily modified to take advantage of the features in the reduction/refinement graphs to facilitate goal-oriented business process modelling.

Goal-oriented horizontal segmentation

As discussed in the Background section, parallel branches, decisions and complex function flows are described within individual processes with by three logical connectors: OR, XOR (exclusive OR), and AND. The interpretation of the connectors within the process model according to Davis (2001, p. 119) and the interpretation of connectors within a means objectives network discussed in the previous section are summarised in Table 1.

The interpretation of the connectors in Table 1 leads to the following rules (illustrated in Figure 2) for the relationship between means objectives and process branches:

- any means objectives that can be achieved by one or more paths should be decomposed into separate means objectives (some of which may be functional objectives) so that process connectors corresponding to the split are reflected in the means objectives network split; and

- the means objectives corresponding to a process path that consists of two or more functions should be decomposed into separate functional objectives connected by an AND operator.

Connector	Interpretation for a process layer	Interpretation for a network of means objectives
OR ⓥ	one or many possible paths will be followed as a result of the decision described by the function immediately preceding the connector	means objective preceding the connector can be achieved by different non-mutually exclusive means
XOR ⊗	one, but only one, of the possible paths will be followed	means objective preceding the connector can be achieved by different mutually exclusive means
AND ⓐ	process flow splits into two or more parallel paths	means objective preceding the connector can be split into more than one objective, all of which have to be met

Table 1: Interpretation of the logical connectors

Figure 2 includes each of the three possible splits, with functional objectives (denoted as *fn*) assigned to the process model being reflected in the corresponding means objectives network and vice versa. It is evident from the mapping that the objectives within one layer of the process hierarchy can be decomposed into multiple levels within the objectives network. Although the network of means objectives in Figure 2 is a hierarchy the same rules apply to a non-hierarchical network of means objectives. Objectives should be used to add time dimension to functions that may appear time-independent within a process model (such as in the example of the *follow-up customers* function in the previous section) although a process model is still required in order to establish whether two objectives aimed at achieving a common objective should be performed in sequence or parallel.

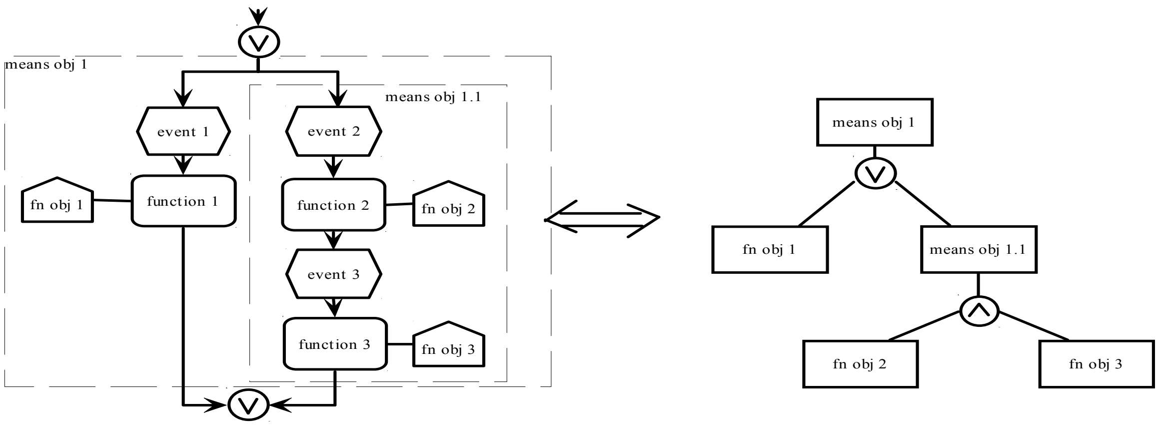

Figure 2a: Process objectives and means-ends network mapping for processes with multiple paths (OR)

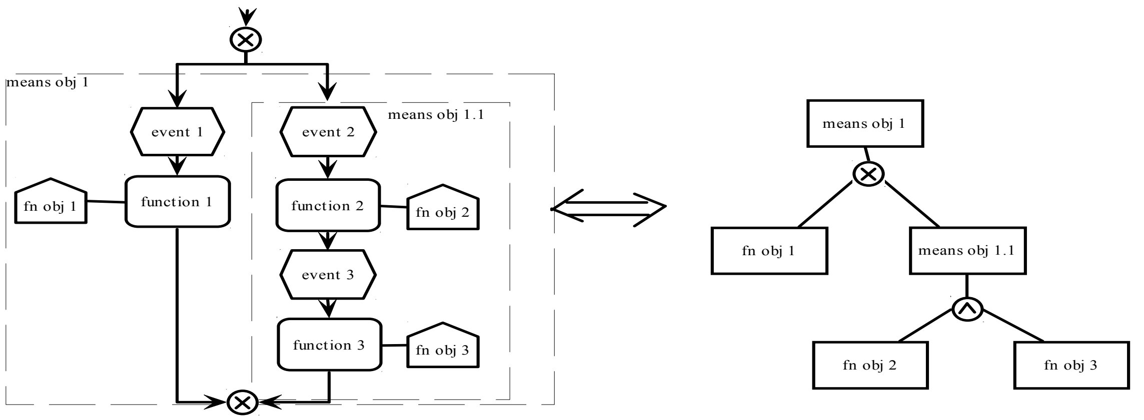

Figure 2b: Process objectives and means-ends network mapping for processes with multiple paths (XOR)

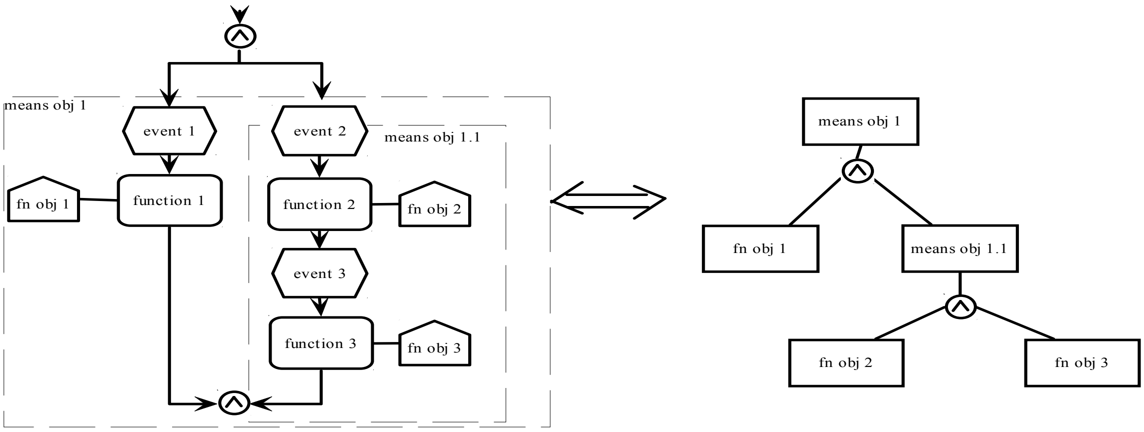

Figure 2c: Process objectives and means-ends network mapping for processes with multiple paths (AND)

Goal-oriented hierarchical decomposition

In this section, we discuss how to synchronise the hierarchical decomposition of functions and processes using an objectives network to guide process decomposition into multiple layers each with more detailed description of individual functions.

As discussed in the Background section, the highest level of the process decomposition hierarchy is the conceptual view often expressed as a value-added chain representing a "high level view of the functions that add value to a business" (Davis, 2001, p. 264). This level of the hierarchy represents the means of achieving the highest level of the means-ends network objectives. Therefore the conceptual level of the process decomposition hierarchy should be determined by assigning a high level function (or process) to each of the high level objectives in the means-ends network. Functions at this level usually correspond to key business processes (e.g. Sales, Marketing, Human Resources, etc) aimed at achieving fundamental objectives of the business through high level means objectives (e.g. Achieve excellence in Sales, Marketing, Human Resources, etc). Note that *many to many* relationship between functions and objectives is permitted. Once the functions at the conceptual level are determined, questions such as "What do you mean by this process?" or "What activities is this process composed off?" should be used to decompose them. These questions asked for each high level function lead to a list of next level functions that are then organised into a process model using process modelling guidelines (Davis, 2001, section 11.4.3).

Means objective network should then be used to determine which means objectives each of the activities within the process is aimed at fulfilling. Most objectives are expected to come from the level of the objectives network corresponding to the process decomposition hierarchy layer, however this may not always be the case. The guidelines for mapping objectives to multiple process branches discussed in the previous section should be applied at this stage to assist with linking objectives and functions within a process layer.

The decomposition of the process is complete once every objective is satisfied through the functions within the process model. If functions, which do not appear to have a corresponding objective are found the objective hierarchy needs to be reviewed to ensure that there is sufficient detail to provide operational guidance. If process decomposition is guided by concerns other than fulfilment of business objectives (e.g. resource allocation, activity costing, etc), functions required for the additional level of decomposition can borrow objectives from the corresponding higher-level functions.

The *many to many* relationship between functions and objectives and the differences in the decomposition structure imply that functions aimed at fulfilling the same objective don't necessarily have to be grouped within the same process.

Although the proposed model appears to be a top-down model, it can be reverse engineered to allow lower level processes to be aggregated into higher level functions by asking the question "Of what more general process is this a part?" In this case, the objectives network is used more as an evaluation and process refinement tool to ensure that all relevant processes are included, and that processes are sufficiently decomposed so that each objective is expressed through the process model. The conceptual model can be also used to assess the ability of existing process models to achieve business objectives using the implementation guidelines discussed in the next section.

The application of the above model to a simple process is demonstrated in Figure 3. The process is represented by two levels of details with the second level being horizontally split using an OR connector. The objectives in the means objectives network correspond to the same *id* functions. For example, objective *o1* is assigned to function *f1*, objective *o2* is assigned to function *f2*, etc. Objective *o5/6* is not directly assigned to any function but is split into two separate objectives either of which satisfies *o5/6.* Function *f1* is decomposed into the 2nd level process to hold the additional details required. Note that objective *o4* assigned to function *f4* contributes to objective *o2* even though function *f4* is not directly linked to function *f2* nor is it part of function's *f2* decomposition. This illustrates a realistic scenario that is not catered for by a strict hierarchy structure.

Consider an example, where objective *o2* requires *a sales target to be met* with the function (*f2*) *market a product* aimed at achieving it; objective *o4 ensure product knowledge* is achieved by function *train a sales person* (denoted as *f4*); function *f1* at the first level of the hierarchy refers to an *induction process for a new sales person*. In this scenario objective *o4* needs to be achieved in order to satisfy objective *o2*, even though *training a sales person* is not directly relevant to the marketing function *f2*.

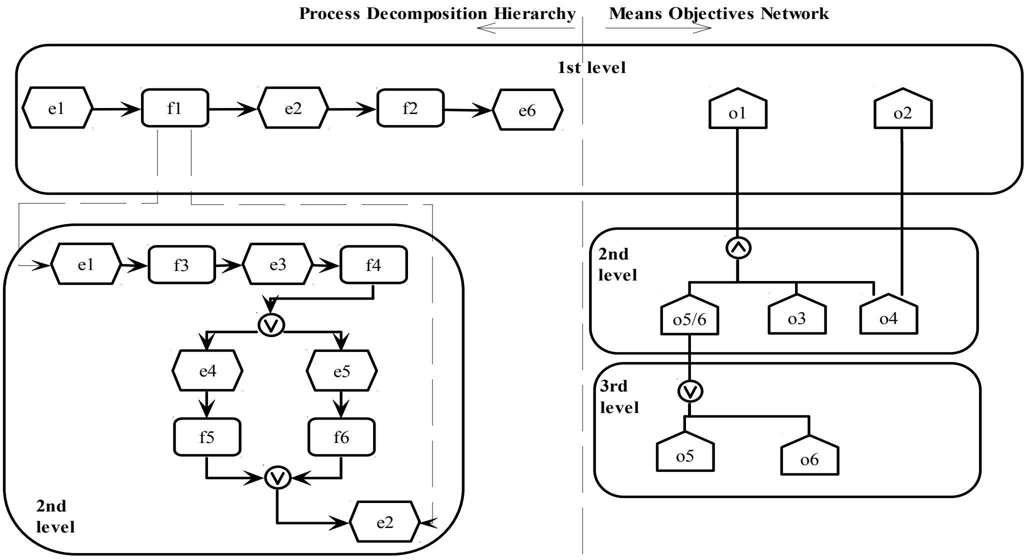

Figure 3: Illustration of the conceptual model

The conceptual model introduced in this section is summarised as follows:

- functions within the conceptual level of the decomposition hierarchy must be linked to at least one objective within the highest level of the means objective network;
- functions at all other levels of the decomposition hierarchy must have at least one means objective assigned to them;
- all means objectives must be linked to functions or be decomposed into lower level objectives that are linked to functions.

IMPLEMENTATION GUIDELINES

The objective of the goal-oriented process decomposition is to "start with the process goals, vision and values and provide a traceable audit of ensuring these are met through the design" (Downs & Lunn 2002, p. 1). Through integration of the value-added thinking framework and EPC methodology, a conceptual model for the identification of process goals, visions and values was provided and is now complemented by a step-by-step guide to facilitate a traceable audit (Figure 4).

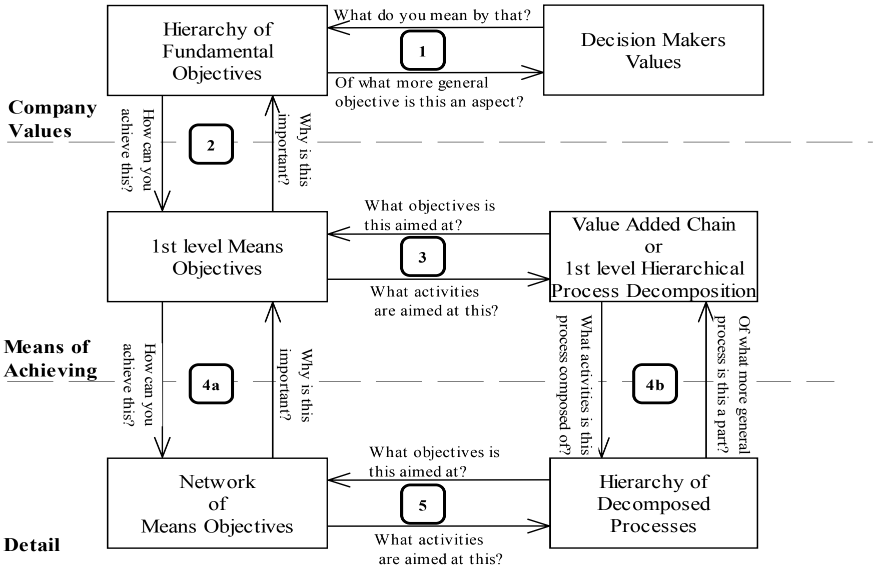

Figure 4: Step by step guide to goal-oriented process modelling "with value-focused thinking"

Figure 4 describes steps required to move from a value-statement to a decomposed process model aligned with these values. Circled numbers represent the order of steps for a top-down model, with the fourth step split into parallel steps 4a and 4b. Arrows pointing in the opposite direction accommodate a bottom-up approach. *Company Values*, *Means of Achieving*, and *Detail* represent three broad modelling levels.

The rules and guidelines for steps one, two, and four are described within the "value-focused thinking" methodology (steps 1, 2, and 4a) and process modelling methodology (step 4b) reviewed in the Background section of this paper. The rules for steps three and five are described in the Conceptual Model section and follow on from: 1) linking "value-focused thinking" and process objectives; and 2) adding logical connectors to the means-ends network. In order to formalise the rules, the formalism of the linkage model (Neiger & Churilov, 2003) should be extended to include hierarchical process links and logical connectors. This topic will be expanded upon in a subsequent paper.

CONCLUSION

In this paper we addressed the topic of goal-oriented methods for business process modelling identified as one of the "three most important issues in driving business processes towards their goals" by the Business Process Management Journal (2003). The discussion has focused on the application of decision analysis tools, and in particular, the "value-focused thinking" framework to the identification and structuring of business process objectives, and extension of the framework to provide a goal-oriented method for process decomposition.

The conceptual model presented in the paper satisfies the key requirement of goal oriented process modelling expressed by Kueng (1997) as "each goal has to find expression in some aspects of the business process model", while maintaining the properties of a non-hierarchical relationship between objectives through the use of "value-focused thinking" methodology and following widely adopted process modelling practices of the EPC methodology. The integration of these two methodologies in a single model builds on the strength of these methodologies while addressing the shortcomings identified within them.

As is clear from the modelling literature, "the suitability of a modeling approach will depend on the goals and objectives for the resulting model. A given language construct or type will be better suited to achieving some modeling objectives than others" (Curtis 1992, p. 86). The conceptual model presented in this paper is not claimed to be universal nor the only way of ensuring goal-oriented process model. In deciding whether to apply this model, a practitioner needs to consider whether the advantages and properties of the model suit his/her particular needs.

Among advantages of using the proposed model are: a rational approach towards process decomposition that facilitates achievement of business objectives by business processes; an ability to integrate a vast library of decision models into process modelling to address both efficiency and effectiveness objectives of business; and access to process modelling capability of widely adopted software applications.

However, the suggested model may not satisfy the requirements of process modelling activities for which other goals such as describing existing processes, identifying resource allocation, etc are more important than designing a process that meets business objectives. Similarly, in the context of requirements engineering or software development, adopting goal-driven models that are specific to that context may be a more cost-effective way of meeting overall objectives of the business model.

In summary, the conceptual model proposed in the paper is a guide rather than a prescriptive model for goal-oriented process modelling with decision analysis tools.

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