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An Evaluation Framework for Enterprise Architecture Modelling

Enterprise architecture management requires an extensive amount of information which concern distinct domains like company strategy, business processes, and IT-systems. To support management with essential information enterprise architecture models are reckoned almost indispensable. However, the creation and maintenance of an encompassing enterprise architecture model has proven to be a challenging task. Very prominent appears to be the diversity of influential factors and the involved long time period. The evaluation framework presented in this article is following a holistic approach integrating relevant technical and social factors. In addition, the complex task of controlling the evolution of the models and their usage is incorporated. The process of judging the economic impact and interdependencies is supported by the new concept of evaluation chains. To make them directly applicable to the domain a dedicated reference evaluation chain based on an extensive compilation of existing knowledge on economic relationships in enterprise architecture modelling is proposed.

1 Introduction

The management of enterprise architectures is an ambitious activity. It encompasses a wide variety of perspectives and interests [Dern03], [HSW04], [Kell07]. They range from the broad and general perspective of management to detailed technical structures, items, and properties of the IT-domain. Additionally, they comprise the perspective of business processes which often is crucial for the effectiveness of IT-utilisation in organisations.

To successfully handle the various issues of the management of enterprise architecture numerous information are required. But information often cannot be easily attained and sometimes mutual understanding between different stakeholders is hindered by misinterpretations due to the complex interrelationships in IT-systems and their usage. Conceptual models offer an appropriate means to provide vital information and by that to support the tasks of enterprise architecture management. For this purpose, a number of generic and more dedicated modelling methods have been proposed (e.g., [BrWi05], [Fran02], [JGB+05], or [Sche00]).

Although the different modelling methods are similar in some aspects, they vary widely in others. Most notably are differences between the object types contained and the symbols used for representing them. Besides the methodological divergences there has frequently been noticed an open dispute between the proponents of enterprise architecture modelling and its opponents. The latter often refer to experiences with many enterprise data models which practically had little impact because they were not completed or were up-to-date only for a short time. Similar problems are also reported from current practice with encompassing enterprise architecture models in companies [Stir01], [Kell07]. Some organisations are using them successfully, but many others have problems after some initial application of enterprise architecture models. Either modelling ceased completely in these organisations or a long-term practice was only established for restricted (minor) domains.

Based on extensive practical experiences and numerous discussions with other practitioners the author concluded that a major hindrance for a wider successful employment of enterprise architecture models lies in the inadequate adaptation of the modelling activities to the particular conditions and requirements of the companies.

A technically and economically well balanced adaptation to these conditions and requirements is not easy and simple because of diverse factors influencing the modelling process. Some of the factors are very prominent like the methods and tools for modelling. Other factors are not so obvious, more difficult to assess and to influence like the culture of information sharing, the modelling management, or the effects of business and organisational change. As the effort for

a thorough analysis from scratch is not predictable and likely to be quite high a method to support a rational evaluation appears to be indispensable.

1.1 Development of a framework to support the evaluation

The development of a systematic framework to support an evaluation of enterprise architecture modelling must, on one hand, collect and compile existing knowledge on different factors influencing its economic results [UlPr90]. On the other hand, it also requires some assumptions on the underlying pattern of its domain and its usage.

The development of the concepts presented in this paper was guided by following assumptions:

- A long-term perspective is essential considering the extent of the activities and the distribution of costs and benefits for enterprise architecture modelling.
- Cooperation of different specialists is required to account for the complexity of the subject.
- Focussing on benefits to business provides for an appropriate guidance to modelling activities and illustrates advantages to management whose backing is indispensable in most cases [ChSc90].

2 A Systematic Approach to Evaluate Enterprise Architecture Modelling

Figure 1 depicts an overview of the proposed systematic approach to evaluate enterprise architecture modelling. The first step of the evaluation is the investigation of the information required by the *business perspective*. It is the basis for identifying the specific *modelling goals* of an organisation and for partitioning the evaluation into separate *utilisation perspectives*. A *standard procedure* directs the work of the evaluation and necessary decisions.

The *reference evaluation chains* offer factual guidance and a basis for documenting the specific valuations of various influences in the examined organisation. The three methods of *decision support* have different purposes [WoFr05]. The *discourse* defines rules for cooperation and exchange of subjective valuations among the participants of the evaluation. The *checklists* support the discourse and the *metrics* ease the continual routine control of the modelling processes.

2.1 Subdividing the evaluation

The subdivision of the evaluation into individual utilisation perspectives is crucial in all organisations except very small ones. It is necessary because of the wide variance in specific qualities for the different domains and the perspectives of people who create models or are involved in enterprise architecture management. For example, management has other demands on the visual design of symbols used in models than the IT-personnel [Pook03]. They again will emphasise precision and detail of information [Pers01].

Much of these diverse requirements are rooted, on one hand, in different working contexts of the stakeholders and, on the other hand, on differences in their formation and knowledge. The individual subdivision of the evaluation depends on the size of the company, the variety of interest groups involved in enterprise architecture modelling and the usage of the models.

After the separate evaluation of individual utilisation perspectives the results will be integrated. This often reveals helpful synergies, but may also uncover conflicting interests which must be settled to realize effective modelling processes [WoFr05]. Besides structuring the evaluation process the utilisation perspectives also provide an adequate means to define areas of responsibility [WPR97]. They considerably facilitate planning and control of the evolution of comprehensive enterprise architecture models.

2.2 Reference evaluation chains

The evaluation is a complex activity requiring the involvement of different specialists. A defined visual language can facilitate the work substantially. Therefore, the method incorporates evaluation chains as a dedicated kind of model. In the following paragraphs the underlying concepts will be presented in more detail.

The analysis of literature and experiences from practice revealed a basic similarity between the mayor influences of modelling process and their respective dependencies on a general level for the different domains ([Fran94], [Pers01], [SHL+05], and [Schü98] et al). These basic facts have been compiled in the reference evaluation chains and represent elementary topics for the evaluation of individual influential factors and their relationships.

For more detailed stimulation of the evaluation discourse further important knowledge is infused into the valuations by *checklists*. The checklists comprise some general questions, like 'Have all relevant alternatives for ... (e.g., the modelling tool) been considered?' and more specific questions like 'Is modelling

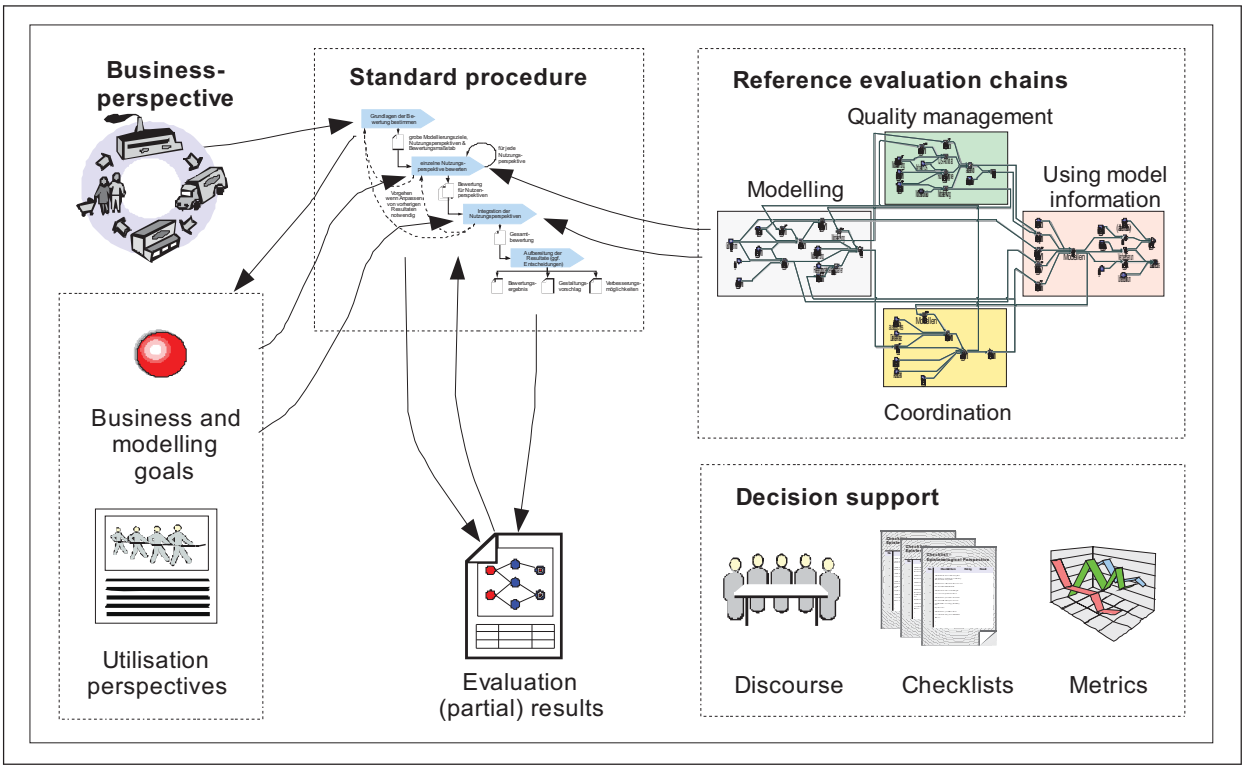

Figure 1: Overview on a systematic approach to the evaluation of enterprise modelling

support available / Can modelling support be guaranteed when it is called for?'.

The complete reference evaluation chain which represents the crucial factors of modelling process overall is often too large. Therefore, the whole reference evaluation chain has been divided into four aspects: a) *modelling*, b) *quality management*, c) *coordination,* and d) *using model information*, which reflect major issues of the complete process.

3 Concept of Evaluation Chain

The concept of evaluation chains has been developed based on a close analysis of the challenges to evaluate enterprise architecture modelling and by analysing contemporary generic methods to support decisions in business. (An early version has been documented in [Wolf05], the challenges in [WoFr05].)

For the evaluation of modelling the following two major problems were identified: (1) the complexity of the topic and (2) the practical necessity for evaluations in different phases of the 'life-cycle' of an enterprise architecture model. The latter is reinforced by the inherent uncertainty connected with many influential factors. This also recommends a long-term approach. Systematic evaluations should start with the design of the modelling framework and be continued as a concurrent control activity during the evolution and use of the enterprise architecture models.

The analysis of generic evaluation methods revealed many deficiencies in respect of the intended usage in the modelling domain (see also [WaSP04]). Classical methods of economic decision didn't support a systematic inclusion of long-term factors and interdependencies [Wolf08]. Most appropriate were the methods based on causal relationship diagrams of decision theory [EiWe99], system dynamics [Ster00], and balanced scorecards [KaNo96]. But they also only partly fulfilled the requirements. For this reason, the new concept of evaluation chains was developed. Besides the fusion of the methods mentioned beforehand they also integrate distinctions for representing the influences in productive processes common in German business administration theory [WöDö05].

3.1 Elements of evaluation chains

To describe the economic relationships in the process of modelling different types of elements are necessary. The elements shown in Figure 2 were selected to cover for an assessment of overall economic results and also the necessity to gain more detailed insights

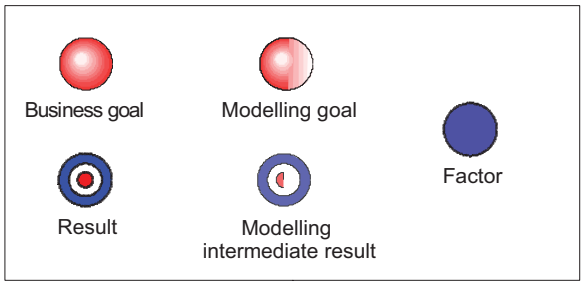

Figure 2: Core elements of an evaluation chain

for design and improvement of a modelling framework.

An evaluation chain is based on three primary element types: a) *goal*, b) *factor* used in the process, and c) *result*. Goals are reflecting a desired state in business. To reach a goal usually one or more factors must be employed. The employment of a factor often incurs some costs. Typical examples for factors in modelling processes are the work of modellers, the modelling tool, but also general influences like the rate of change in the business.

Another differentiation is due to the significant difference between goals and results which originate a) in the business and b) those which are part of the modelling activities. The former have a direct link to potential benefits that can be generated by modelling while the latter have the status of derived goals which are constrained by the peculiarities of the business goals.

This distinction emphasises *business goals*. It is intended to direct modelling in a way that it provides real benefits to the business. A *Modelling goal* reflects a required or aspired state which is necessary for the modelling processes. Usually modelling goals have a higher degree of variability compared with business goals especially during the design of a modelling framework.

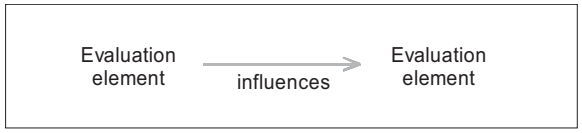

Figure 3: Relations between elements of an evaluation chain

To depict the relations between elements only one type of relation is used, the type *influences*. It is sufficient for a discursive evaluation. If necessary it can be classified more specifically through annotations (e.g., see [UlPr90], [Seng90]).

Figure 4 sketches the principle of an evaluation chain. It reflects the most important elements for an evaluation. It starts with a *business goal*. To reach this goal some dedicated *modelling goal* is aspired. A *factor* must be employed to realize it. This factor produces a *modelling intermediate* result which refers to the modelling goal. The modelling intermediate result influences a (final) *result* which satisfies a business goal. The picture of Figure 4 just demonstrates the principle. Normal business processes and particularly modelling are not as simple. They usually contain many steps with corresponding intermediate results. (For the process of modelling see next chapter.)

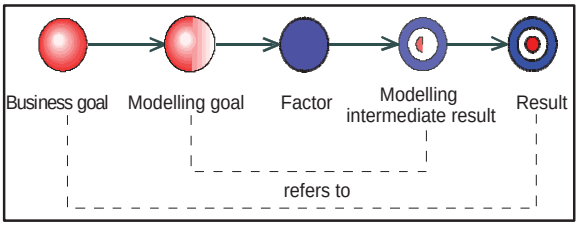

Figure 4: Principle of an evaluation chain

Some more auxiliary elements are used in the evaluation chains. The elements the *referenced factor*, the *referenced intermediate result* and the *aggregate intermediate result* in Figure 5 derive their semantics fully on their base-elements. They only simplify the graphical diagram of extended evaluation chains.

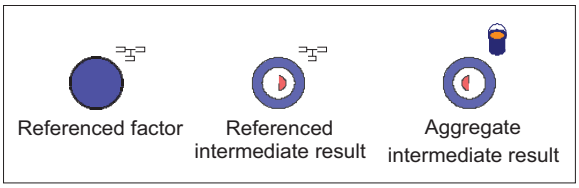

Figure 5: Elements to simplify complex evaluation chains

The *referenced* elements can be used to separate evaluation chains for different aspects. The aggregation is especially useful to collect the costs of all factors used in the process. Without this element an evaluation chain would contain a big number of relations not adding any substantial information. So the aggregation element helps to concentrate on the useful (intermediate) results in the process-oriented 'flow' of the evaluation chain. (A more extensive description of the concept of evaluation chains including a meta-model is in [Wolf08].)

3.2 Derivation of modelling goals

The modelling goals must be founded in existing business goals for adequate economic results. Therefore, the analysis of the business goals, the derivation and formulation of the respective modelling goals is crucial for the evaluation process. It is rooted very much in the particular conditions of the organisation [Wolf02].

Typical direct goals for using information from models are, e.g., the transfer of information, the analytical use to support decisions or automation purposes [Schee00], [PeSt01], [JJN+06]. These direct goals are usually directed at higher more comprehensive goals like the attainment of higher organisational flexibility, cost reductions or to speed up reactions in cases of breakdowns or emergencies [Leis04]. Besides the purpose of using the information also an explicit definition of the information required is essential.

The analysis of goals has a crucial role in the setup of the evaluation process. The goals and their importance are a main indicator for the potential benefits. Anyway, the description of the reference evaluation chains in the following chapter will concentrate on the flow from the factors employed in the modelling process to the results achieved. This view is similar to one used in balanced scorecards [KaNo96].

For standard cases in IT-architecture modelling it is intuitive to derive the correspondent goals to the (intermediate) results displayed in the reference evaluation chain directly. If an organisation aims for numerous partially conflicting goals a more complex situation is given. (E.g., the broad distribution of the models would require a high usability and comprehensibility, and a usage in IT-configuration would necessitate formal exactness and high degree of detail.) In these cases a dedicated evaluation chain with explicit goals can easily be deduced from the reference evaluation chains due to the direct *refer to* relationship between each (intermediate) result to a corresponding goal.

4 Evaluation Chains on Modelling

In this Section the introduced concept of evaluation chains will be applied to enterprise architecture modelling. The description is divided in the four basic aspects: *modelling*, *coordination*, *quality management* and the *usage of model information*.

The evaluation chains explicitly point out which intermediate results are necessary to reach the goals, e.g., sufficient *knowledge of the modellers* to achieve a good *effectiveness of modelling*. Sometimes the composition of a factor is fixed for reaching a particular goal. Anyway, quite frequently one (or more) influential factor(s)[1] or intermediate result(s) is (are) not essential for a subsequent (intermediate) result. Or the composition of the influences is not fixed. Then this constitutes an opportunity for substitution which can be advantageously used to improve the economics of the modelling. E.g., if the *modelling tool* has a poor usability an improvement of the *knowledge of the modellers* can provide for a sufficient e*ffectiveness of modelling*. By that the relations contained in the reference evaluation chains can give new insight to devise a more economic way of modelling.

4.1 Aspect of modelling

Figure 6 displays the evaluation chain of the *aspect of modelling.* A major intermediate result for an effective framework to support modelling work is a high *effectiveness of modelling* [Schü98], [Fran94].

A number of factors and intermediate results influence the modelling effectiveness: a) the *extent and complexity of modelling*, b) the *knowledge of modellers,* c) the *standard procedures for modelling* [SHL+05], d) the *modelling tool usability,* and e) the *accessible model patterns* [Pook03], [Fran07]. Very prominent in this list are the knowledge of the modellers and the modelling tool usability.

The modelling tool usability depends on the *modelling tool* [DLF+05], the *modelling support*, the *initial knowledge of modelling in the group,* and *modelling training*.

To some extent also the *modelling language* is influential, but this has not been included (see [HaRu00]). On one hand, it is considered via the knowledge of the modellers and the *comprehensibility of the modelling concepts* [FiHö06]. On the other hand, the discourse as main mode of evaluation comprises another opportunity to include additional factors in the valuation if required [Renn01].

In the reference chain on the aspect of modelling three referenced intermediate results appear: the *extent and complexity of modelling*, the *modelling activities,* and the *available model portfolio*. The first one, the extent and complexity of modelling is an intermediate result which was located in the aspect of quality management as it is mostly discussed in this context. The other intermediate results stem from the aspect

1.The small letters on the right top of the symbol of a factor give an indication on how easily the factor can be adapted.
'V' = Variable factors can be adjusted easily.
'P' = Potentials are factors which can be changed during design of the modelling environment or over a longer period of time.
'E' = External factors cannot or only partly be changed.

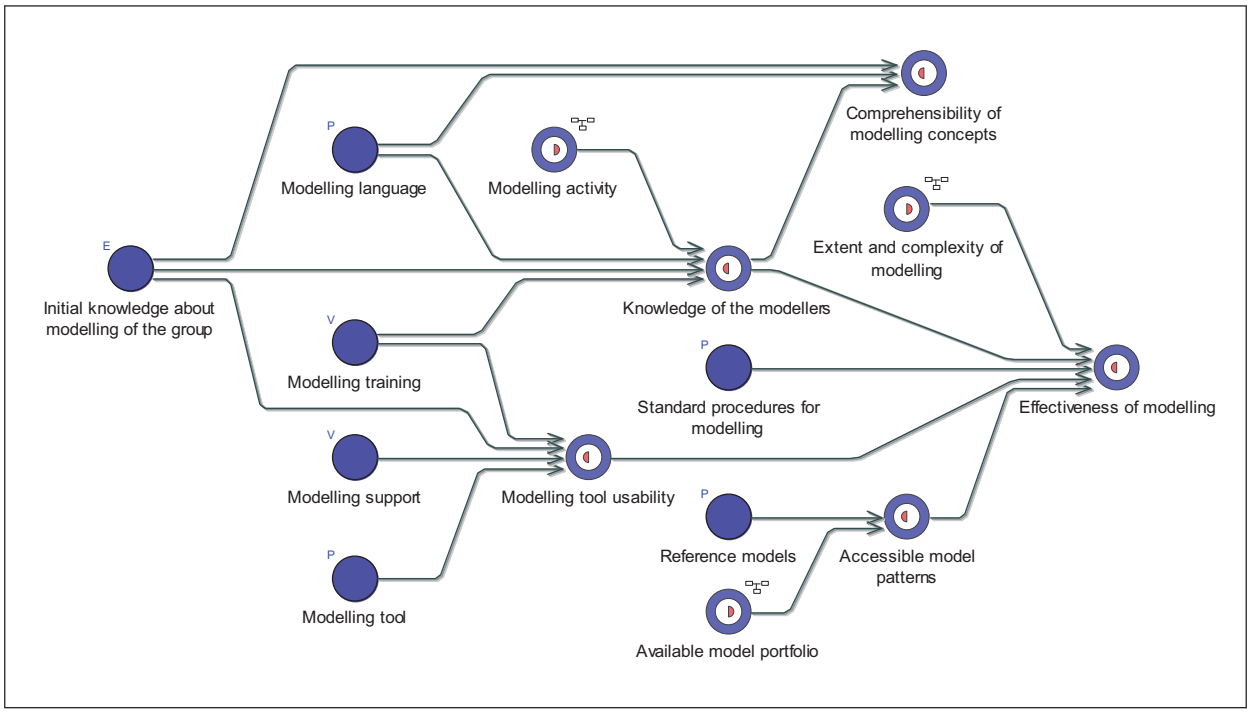

Figure 6: Evaluation chain for the aspect of modelling

of coordination and reflect learning feedback from modelling practice which usually is very supportive and improves the capabilities of an organisation [Seng96], [LPG98].

For the aspect of modelling many factors are determined during the design of the modelling framework, e.g., the modelling language and the modelling tool. Nevertheless, during practice of enterprise architecture modelling there are quite some opportunities to improve on the economics of the process by adapting other variable factors like the availability of accessible model patterns or additional modelling support.

4.2 Aspect of coordination

For most organisations the full value of enterprise architecture models can only be achieved if modelling is institutionalised as a current and thereby long-term activity. On one hand, it is usually impossible to create all the required models for enterprise architecture in a short period of time. So an evolutionary approach is advisable. On the other hand, the organisation changes over time. For good decisions it is crucial that management has access to valid information. For this reason, it must be assured that the models are always consistently updated when their domains change [Maie96], [Davi01], [BBK05].

Consequently, coordination takes a central position in the activities related to enterprise architecture modelling (in contrast to modelling in projects where it is often a special means for restricted purpose).

The main purpose of the coordination is to provide for an adequate *available model portfolio*. Therefore, the direct *modelling activities* have been included in this aspect although they could have similarly been positioned in the aspect of modelling. In Figure 7 the main elements of the evaluation chain for the aspect of coordination are displayed.

The available model portfolio is influenced by present and former modelling activities. If models are used to maintain knowledge then a big difference in the distribution of costs and benefits depending on the time of modelling should be included in the consideration. On one hand, the cost to document knowledge in a model is quite low when a new system or process is designed. But then the modellers have little benefits for themselves as they know the underlying facts and might not require the model [Jorg02]. On the other hand, the costs for regaining the knowledge are quite high when related information is required later, e.g., to support operations or changes but knowledge has been lost or decreased [WPR97], [Maie04]. The following factors and intermediate results offer some opportunities to incite modelling activities required from the organisational position.

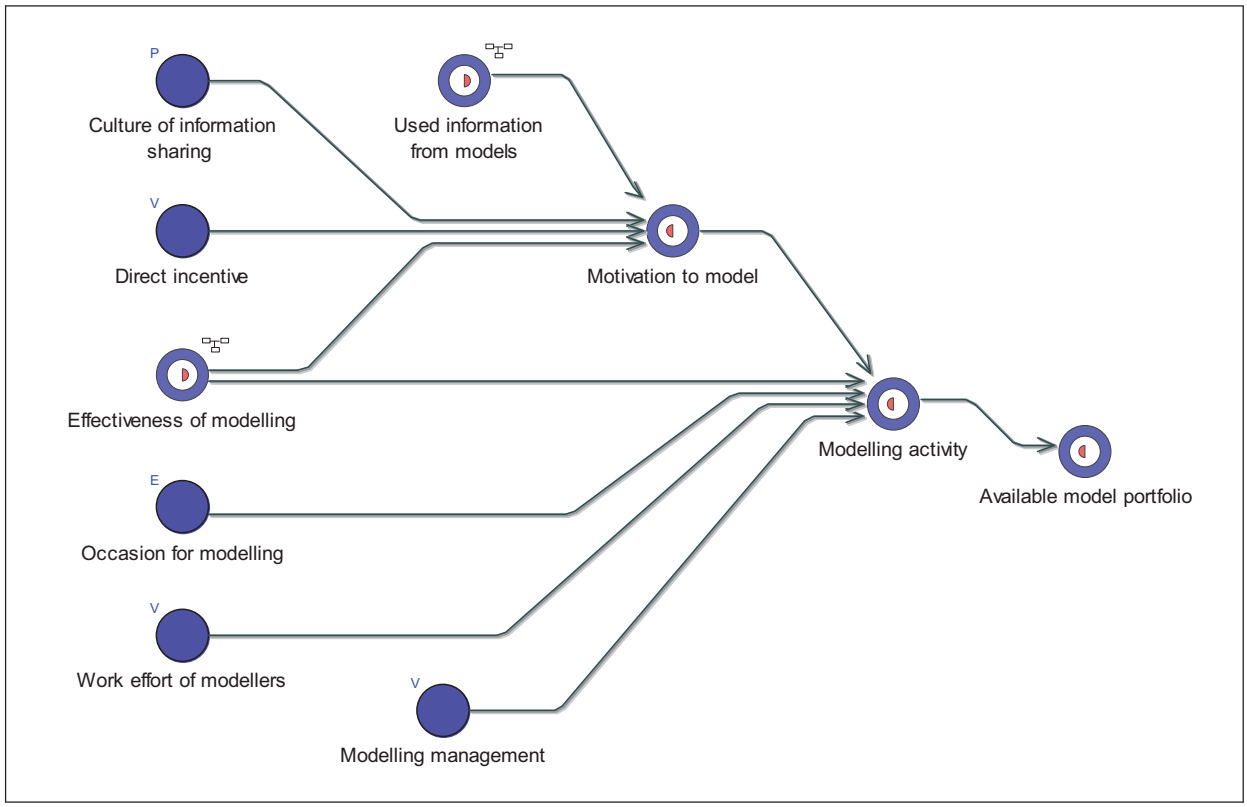

Figure 7: Evaluation chain for the aspect of coordination

A general and supportive influence for a good individual and organisational balance of costs and benefits is a high *effectiveness of modelling* (referenced intermediate result). The *motivation to model* is another intermediate result affecting the modelling activities [More02], [WöDö05]. If modelling is not part of common duties an organisation can either improve the motivation to model by *direct incentives* or care for an adequate *culture of information exchange* [Herb00]. Anyway, the latter can usually only be formed by long-term practice so for operational purposes some direct incentives are indispensable in many cases.

The *external* factor of the *occasion for modelling* is frequently neglected in theoretical reflections. But in practice it has a substantial and very positive effect on modelling activities (e.g., if in a change project the affected business processes are modelled). To initiate and coordinate them involves also activities from *modelling management*. Actually modelling management comprises diverse functions, like planning for the evolution of the enterprise architecture model, initiating required modelling activities, and the management of conflicting issues, e.g., between different modelling perspectives or domains [Davi01], [BBK05].

The *used information from models* represents a feedback for the motivation to model. It will be quite convincing if information from models really facilitate other work [MSD98]. But this feedback cannot be used for direct control of modelling processes as it usually takes some time until this feedback-loop is effective. Anyway, to consider this feedback helps to plan the evolution of the model portfolio in a way so that subsequent modelling activities support each other as much as possible with relevant experiences.

4.3 Aspect of quality management

The quality of a model is fundamental for its usage. Depending on the purpose for which information are used different facets of quality or combinations of them are essential [Mood05]. The criteria of correctness, relevance, and clarity are of general significance (compiled from [Schü98], [MSD98], [Fran07]).

If information is collected from numerous models which were created at different times it is important that all model information is up-to-date [Eppl03]. This issue is related to the criteria of correctness. But it must be taken into account that models that were correct when they were created may have gone obsolete

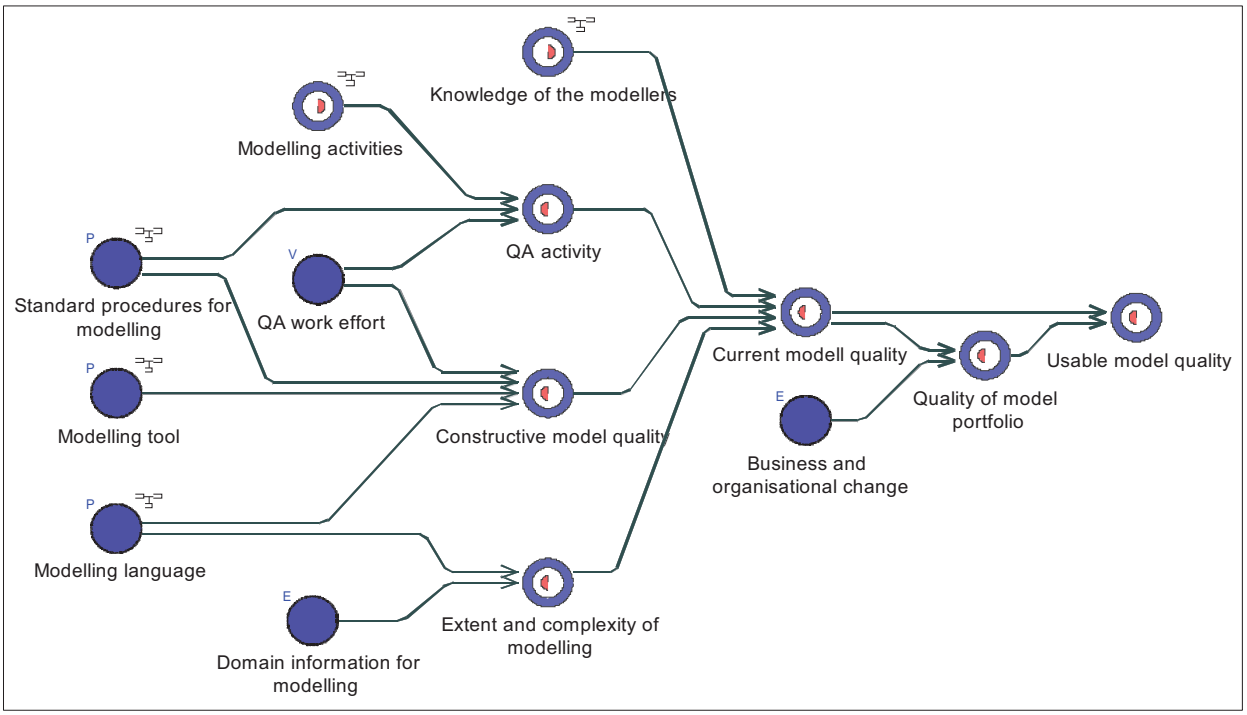

Figure 8: Evaluation chain for the aspect of quality management

due to *business and organisational change*. This is reflected in the evaluation chain of the aspect of quality management in Figure 8 by the distinction between the intermediate results of a) the *current model quality* and b) the *quality of the model portfolio*. The importance of each of them for the *usable model quality* depends on the task at hand. If the task relies on recently modelled information the current model quality is decisive. If, e.g., information on the existing infrastructure is required then the quality of the portfolio is crucial.

Whether high quality models are created depends on the modelling conditions and processes which are presented in the evaluation chain by the intermediate results of the *knowledge of the modellers*, the *QA activities* (quality assurance), the *constructive model quality*, and the *extent and complexity of modelling*. The latter has a close relationship with the required information from the models and its underlying domain. Furthermore, it is influenced by the *modelling language* and its capabilities to depict the facts from the domain.

The examination of the results of *modelling activities* in QA activities are the classical way of checking the quality produced. If necessary the quality of the models is improved subsequently (e.g., [Davi01]). Important basis for this are the *standard procedures for modelling* which prescribe the sequence of activities and the way they are performed. Besides this approach to inspect and correct models the activities for *constructive model quality* are directed towards a modelling framework which assures that models directly conform to the required quality properties [MSD98], [Eppl03]. This is aimed at less error-prone modelling so that fewer or even no direct checks (QA activities) on created models are required.

4.4 Aspect of usage of model information

The aspect of usage is central for the benefits of models for IT-architecture management in an organisation. To reap the benefits some conditions are requisite. As shown in Figure 9 the *usage of model information* is based on four intermediate results and one factor: a) the *usable model quality*, b) the *comprehensibility of modelling concepts*, c) the *modelling tool usability,* d) the *available model portfolio,* and e) the required *work of users of models*.

Some intermediate results are prerequisites, like the availability of respective models. Others influence the work effort of the users of the models, like the modelling tool usability or the comprehensibility of modelling concepts. Some intermediate results depend on special requirements, e.g., the provision of formally correct models for automatic conversions. Anyway, if the effort for the users exceeds an individually

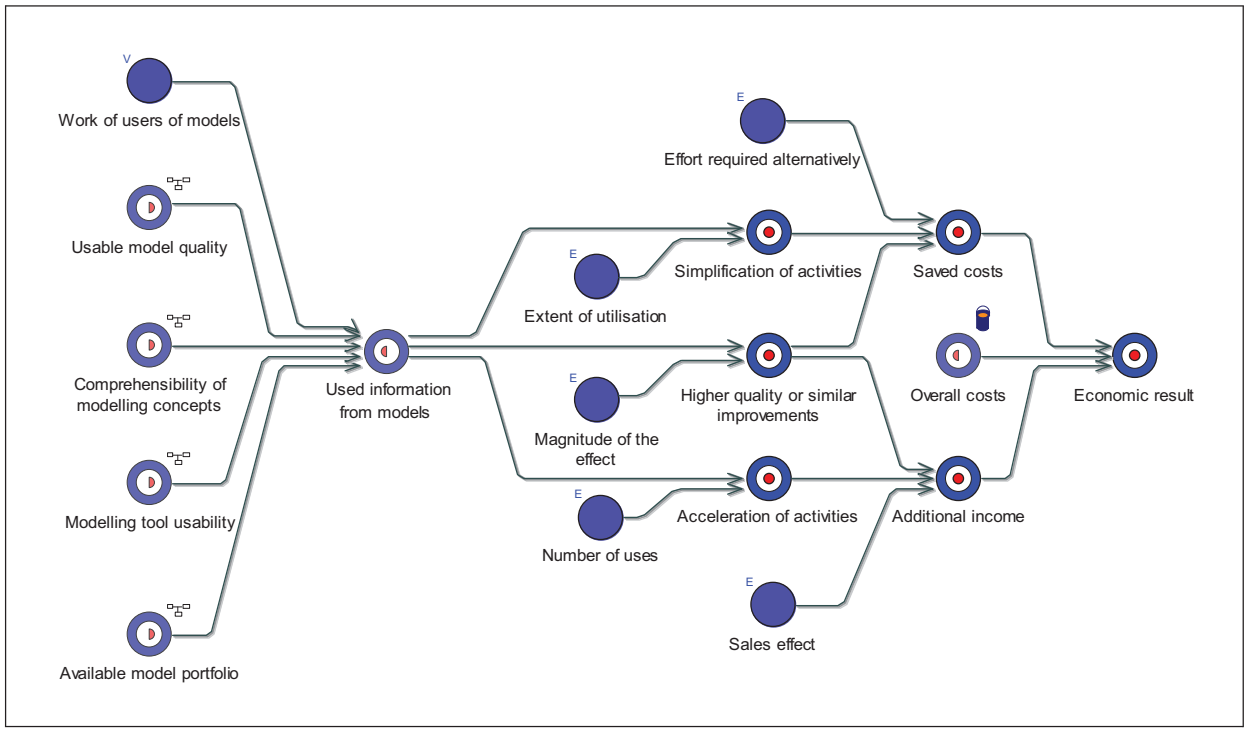

Figure 9: Evaluation chain for the aspect of usage of model information

determined limit the models will be ignored by potential users (similar to [Shne03]). This in turn would diminish the potential benefits from a model for a particular occasion completely.

The basic reference evaluation chain on using model information in Figure 9 distinguishes three kinds of results as main sources for economic benefit from the use of model information, a) *simplification of activities*, b) *higher quality or similar improvements,* and c) *acceleration of activities*.

In an individual evaluation and for a specific utilisation perspective normally a more detailed goal analysis and more detailed economic results would be evaluated. This concerns the intended impact of the usage of models, the supported tasks, an alternative (effort), the required content of the models, and last but not least the strategic relevance of model usage [PeSt01], [WaWe02], [Leis04].

Nevertheless, the three general categories of results in the reference evaluation chain above represent an adequate heuristic to focus not on single (often technical) effects of the model usage but on substantial economic impacts for an organisation [Nage90], [DeMc03]. Each of the three results is influenced by one external factor in the reference evaluation chain. The factors, the *extent of utilisation*, the *magnitude of effect* and the *number of uses*, reflect characteristics of the organisation which are not directly connected to modelling activities but to the potential economic benefits that can be reaped by utilisation of enterprise architecture models.

For a monetary estimation, e.g., a return on investment analysis, all resulting positive benefits for enterprise architecture management in *saved costs* and *additional income* can be set against the *overall costs* of the modelling processes (resources employed, external costs, etc.).

The evaluation chain may convey the impression that all elements and relationships are easily accessible. Anyway, particularly the factors relevant for the valuation of the benefits of enterprise architecture modelling incorporate numerous uncertainties. So it is the primary function of the evaluation chain to focus and document the progress of the evaluation of the complex activities connected with enterprise architecture modelling [BBK03].

In many cases, a concentration on monetary values is not appropriate particularly in the first stages of enterprise architecture modelling. Therefore, different modes to formulate evaluation results are sensible, e.g., to demonstrate the impact of model usage in substantive results related to the effect on quality in business processes. This often is more adequate and can likewise convince management that the concerted effort to model enterprise architecture promises substantial benefits to a business organisation.

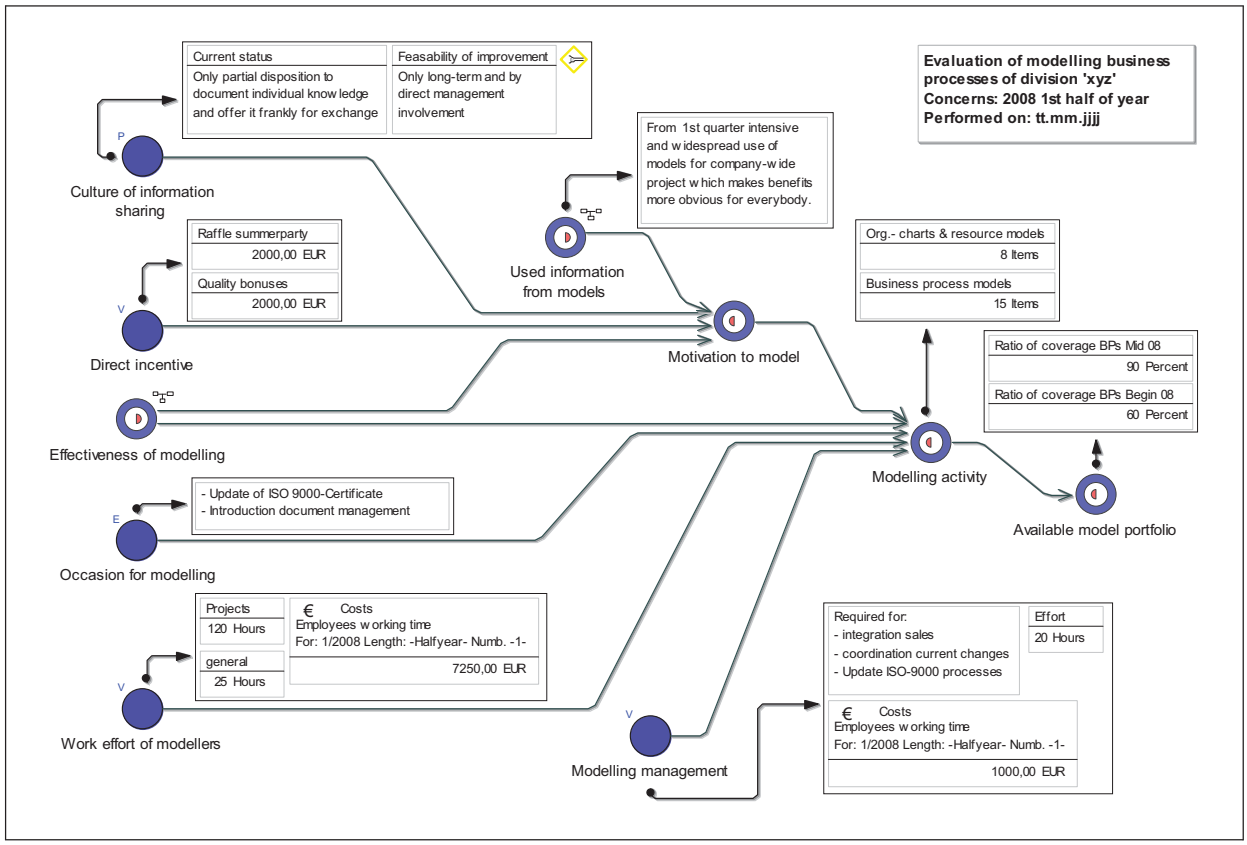

Figure 10: Example evaluation chain for the aspect of coordination with respective results

4.5 Documenting evaluation results

The method of discourse has been used successfully to settle very complex issues [Renn01], [WoFr05]. In practice a sufficient means to document partial and final values for the elements of an evaluative discourse is mandatory for an effective progress. This is of particular importance if the distinct utilisation perspectives are analysed separately and the outcomes aggregated subsequently.

Depending on the nature of the analysed element, the available knowledge, and the purpose of the evaluation, different types of values can be necessary to describe the assessed quality. Therefore, evaluation chains provide the following types of value: a) numeric values, with definable dimensions (including money), b) enumerations, and c) qualitative descriptions.

Figure 10 displays an example evaluation chain for the aspect of coordination with respective values for each element. The *culture of information sharing* cannot be quantified and is consequently described qualitatively. The *direct incentive* and the *occasion for modelling* are characterised by discrete facts, so they are documented in this evaluation chain with enumerations. The *work effort of the modellers* and for the *management of modelling* is expressed by hours of work required and the entailed costs.

It may appear that only outcomes or status of elements at the end of the evaluation chain are of high importance. But this would neglect the main intention for using an instrument like the evaluation chain because values for factors and intermediate results in the initial steps of the modelling process are supportive or even indispensable for the later ones. So they often indicate potential problems at early stages when their correction or avoidance is possible at low costs [UlPr90], [Ster00].

The reference evaluation chains are also intended to assist concurrent control. In this context the evaluation results will not be determined in a discourse but are based on metrics which correspond to the elements in the evaluation chains. These are metrics from modelling processes, e.g., number of support calls, time to find model information, and query-based indexes to indicate satisfaction-levels in regard of models or other relevant items (analogous to [KaNo96]). This also comprises specific metrics from the enterprise architecture models, e.g., their quantified contents and their complexity [Belle07].

5 Critical Reflection of the Evaluation of Enterprise Modelling

The framework presented describes a comprehensive guide for an individual organisation to evaluate existing or planned activities to model its enterprise architecture. It incorporates two often neglected facets, the benefits to business, and the effects of the long term processes.

But the framework does not propose an easy calculation procedure. It requires many specific valuations and decisions. For them a high degree of cooperation among specialists is required. Nevertheless, if the participation is well accomplished it will inherently motivate a number of key persons to support the crucial modelling process [Cibo87], [WPR97], [Davi01].

As organisations and their goals vary widely the approach incorporates a high degree of flexibility which supports the development of individually adopted schemes for economic evaluation and control. This is done by the standard partitioning of the evaluation into utilisation perspectives and can be enhanced by changing and adapting the reference evaluation chains for specific usages of enterprise architecture models in an organisation.

A critical issue in regard of the framework can be seen in the effort required for an evaluation. Anyway, this effort will usually be only a fraction of the effort a company has to invest in modelling its enterprise architecture. Therefore, an economic design of the modelling foundations almost certainly improves the economic results. For a company which otherwise would not start a modelling initiative the evaluation presents an opportunity to check whether there might be potential benefits which are not recognized now. For example, in the context of quality management it has been noted by theory and practice that if no attention is given to some precautionary measures the resulting negative effects for a company are in many cases enormous [Cros84].

The presented framework to evaluate enterprise architecture modelling relies to a high degree on subjective judgements of experts. It would have been desirable to derive a scheme grounded mostly in objective measurements. Due to the influences of particularities of the individual company and the modelled domains this was not viable. But the framework supports an evaluation in a structured process that contributes to a well founded assessment and valuation. So the outcome should be more convincing than previous general judgements. Additionally, the clearly laid out procedures help to calculate the effort for an evaluation.

6 Conclusion and Prospects

For practice, the integrated approach to evaluate the economics of enterprise architecture modelling serves to objectify decisions rather thoroughly. Until now these decisions could usually only be based on belief or simplified reasoning. For science, the framework offers a comprehensive set of concepts to facilitate the exchange of research findings on the economics of enterprise architecture modelling.

Additionally, the framework provides a company with a pragmatic foundation to control modelling activities and learn from the analysis of intermediate results. This enables to take corrective action or initiate improvements if problems or deviations are identified. Thereby, the framework can be used to assure that the processes deliver promised benefits. Collecting experiences on the economic factors and their relationships over some time should help to make the application of the framework routine and the estimations involved more reliable.

An extended application of the framework will contribute, on one hand, to a more cost-effective design of the foundations for enterprise architecture modelling. On the other hand, the related modelling activities will be directed much more towards domains which yield the highest economic benefits.

This may not promote all current modelling activities and perhaps even inhibit some currently practiced. For some companies it may shift the focus of modelling to support the daily tasks in enterprise architecture management. Other companies may see a higher benefit in the landscapes for medium-term decisions and in their support in alignment to strategic initiatives. In any case, a good evaluative practice in this field is expected to improve the general standing and status of modelling enterprise architectures in a company. Furthermore, a better overall adjustment of the modelling activities to the strategic perspective of a company should generate a firm boost to enterprise architecture modelling.

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