Strategic Business and IT Alignment Assessment: A Case Study Applying an Enterprise Architecture-based Metamodel

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Abstract

Strategic Business and IT Alignment (SBITA) is still ranked amongst the top concerns of the enterprise's management executives. Such alignment is an organization-wide issue that influences the company's overall performance and its assessment is a fundamental input for the enterprise's managers to make informed decisions on SBITA enhancement possibilities. This paper reports the application of an Enterprise Architecture-based SBITA assessment metamodel in a case study conducted in an intensive IT service enterprise. The case study addresses two research questions: How can be applied the proposed Enterprise Architecture-based SBITA assessment metamodel in enterprises? and What is the quality and use of the results of such application? The authors have published the Enterprise Architecture-based SBITA assessment metamodel as a tool that combines the comprehensive and systematic modeling practices in the field of Enterprise Architecture with the guidance of tested and benchmarked SBITA assessment expert's method. Luftman's assessment method was selected in this research project.

1. Introduction

1.1. Strategic Business and IT alignment

Contemporary enterprises have evolved IT systems (IT) through implementing specific solutions that respond to particular business processes rather than through carefully and systematically defined organization wide strategic plans [12][10][4][2]. Moreover, the dynamic evolution of enterprises' business, driven by new technologies, competitive pressures, regulatory changes and other factors, demand immediate IT support. The combination of non-planned IT system development and the rapid changes and evolution of the business environment has made many enterprises' IT systems inefficient and close to chaotic [12][13]. It is thus not surprising that Business and IT alignment (BITA) is a major organization-wide concern that directly influences the company's overall performance [20] and has been ranked amongst the five top concerns of the enterprise's management executives for over a decade [7].

In general, however, business executives have the perception that BITA efforts facilitates projects with technical and process-engineering objectives rather than projects that would clearly leverage enterprise resources and improve competitive positioning [15]. To attain a more balanced business and technical BITA we address the Strategic Business and IT alignment (SBITA), defined as a continuous process of conscious and coherent interrelation of all components and personnel of the business and the IT in order to contribute appropriately and timely to the business goals and needs over time [9][5][6][3]. SBITA will hereafter be shortened to alignment.

1.2. Enterprise Architecture

Enterprise Architecture (EA) is a business and IT management tool that has grown in popularity during the last decade. It is based on models of business and IT with systematic frameworks. These frameworks detail all relevant structures within the enterprise, including business, applications technology, data and their relationships to perform business. An EA can be built with a particular and defined architectural framework or some customization of a framework that has been created [1]. The end product is a set of artifacts that describe in varying degrees of detail what a business does, how it operates and what resources it requires. These artifacts are often graphic models [14].

1.3. Issues addressed and organization of this paper

This paper addresses the assessment as a fundamental input for an informed decision on SBITA

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enhancement possibilities. Such alignment assessment can be managed by EA-based approaches.

Since the EA frameworks do not explicitly focus on how to do this alignment assessment, an EA-based metamodel alignment assessment guided by SBITA assessment expert's method has been presented in previous paper and is summarized in the next chapter [11].

This paper reports the design, conduction, results and conclusions of a case study focuses on (a) How the proposed EA-based alignment assessment metamodel is applicable in enterprises and (b) The quality and use of the results of applying the EA-based alignment assessment metamodel. This case study is one in a series of implemented and published cases where other alignment assessment approaches have been applied. The case studies have been conducted in enterprises in Nicaragua and Sweden as part of an ongoing research project funded by the Swedish International Development Agency (Sida).

1.4. Outline

Section two of the paper briefly describes the EA-based alignment assessment metamodel to familiarize the reader with the assessment tool applied in the case study. Section three deals with the design of the case study, describing its replicable steps, phases and processes. In section four we describe the conduction of the case study including the alignment assessment resultant model. In section five we show the lessons learned from the application of the EA-based alignment metamodel. Finally, in section six we present our conclusions about the application of the EA alignment metamodel.

2. The Enterprise Architecture-based alignment assessment metamodel

The EA-based alignment assessment metamodel, from here on indistinctly called metamodel, is a tool deduced from combining the comprehensive and systematic modeling practices in the field of EA with the guidance of a tested and benchmarked alignment assessment expert's method [12]. This alignment assessment metamodel has been affiliated to the EA as a feasible tool for the alignment assessment concern, aimed at mitigating the expenses and drawbacks of the often larger modeling required to fully apply the multi-concerns EA Frameworks [11].

We adopt Luftman's Strategic Alignment Maturity Model and assessment method as the reference expert's method that correctly describes the alignment assessment since it is theoretical and empirically well founded. [2][5][6][8]. The fact that we consider the Luftman's SBITA method as the representative constructs of alignment assessment with its benefits and limitations might be argued against. However, that discussion is not the subject of this paper.

2.1. The theoretical base

Most of the experiences on SBITA assessment have been developed before or parallel to the advent of the EA practices. To a greater or lesser degree they explicitly or strictly lack the EA's goals and principles. On the other hand EA frameworks are seldom explicit with how to perform scenario analysis in structured way. Although the EA and the SBITA addresses the same issue both disciplines "lives parallel separate lives". We argue that most of those extensive SBITA theoretical and methodological underpinnings experienced in case studies and academic publications can be bridged and provide complementary benefits to the field of Enterprise Architecture [12] [11][13].

Luftman's SBITA method is represented in a graphic structure, which is constructed with close syntactic and semantic correlation. The full graphic structure representing Luftman's method can be found at [17]. For space reasons a partial presentation is drafted and details are presented for a chosen example in Figure 1. This figure shows the 6 alignment assessment criteria. The *Quality of Communication* criterion is presented with its 6 criterion components to be assessed. The figure also offers a detailed representation of the alignment assessment levels of the *Style and ease of access by the IT & business* criterion component.

Each of the 6 criteria has several criterion components, 38 in total. Each criterion component in turn has 5 alignment assessment levels according to specific enterprise data.

2.2. The Enterprise Architecture metamodel

The EA-based alignment assessment metamodel is a defined set of templates of artifacts for modeling, i.e. classes, enumerations and relationships, from which to instantiate the data that should be collected from an enterprise in order to generate its "as-is" alignment model. The alignment assessment is done according to a set of inference rules interpreted from the ones defined in the Luftman's method, the inputs for such inference rules are the instances found in the enterprise [5][6].

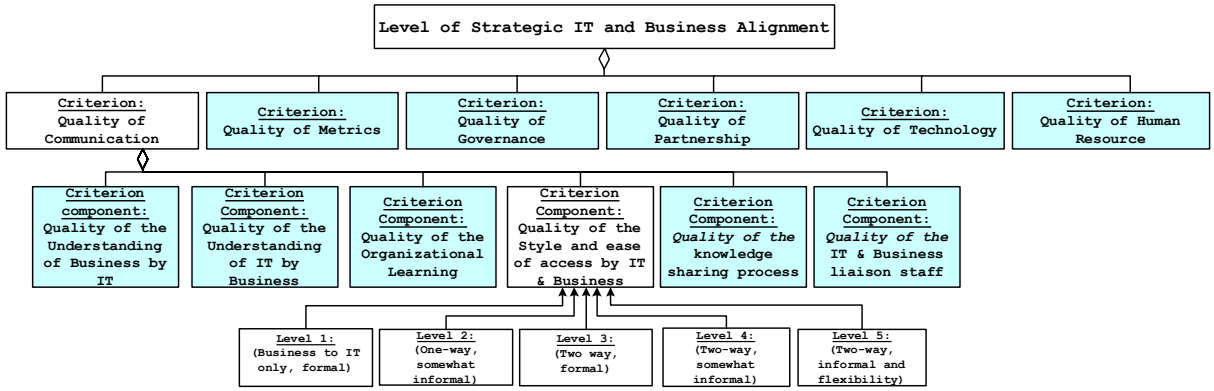

Figure 1. Partial graphic representation of the Luftman's method

From the graphic representation of the Luftman's method, the criteria and criterion components in the metamodel are, respectively, Viewpoints and Viewpoint components. Each of the 6 Viewpoints has several Viewpoint components, 38 in total for the metamodel, and each Viewpoint component has artifacts, 74 in total for the metamodel, which can be modeled according to the collected enterprise's data.

Our proposed metamodel, consisting in 74 artifacts and 190 inference rules can be found at [16]. For space reasons in Figure 2 a partial representation of the metamodel is drafted and details are presented of the chosen example. The 6 alignment assessment Viewpoints can be seen in this figure, together with the Viewpoint components of the *Communication* Viewpoint and a detailed representation of the artifacts of the *Style and ease of access by the IT & business* Viewpoint component.

The set of artifacts in the metamodel, templates of classes and its attributes, enumerations, relations, and inference rules based on the data collected from the artifacts are our contribution for linking the expert method chosen, originally based in open questions for collecting the enterprise's data, to the EA field [16]. The metamodel facilitates the standardization and replicability of the data to be collected at the enterprise, by using a defined set of artifacts, enhancing the credibility of the alignment assessment. The alignment assessment metamodel is an extension of the already deployed and tested enterprise-wide assessment published in [2].

2.3. Instantiation of the metamodel and alignment assessment

With the data collected at the enterprise, some of the artifacts of the Viewpoints and Viewpoint components will be instantiated in a model of the Enterprise's SBITA alignment "as-is" model

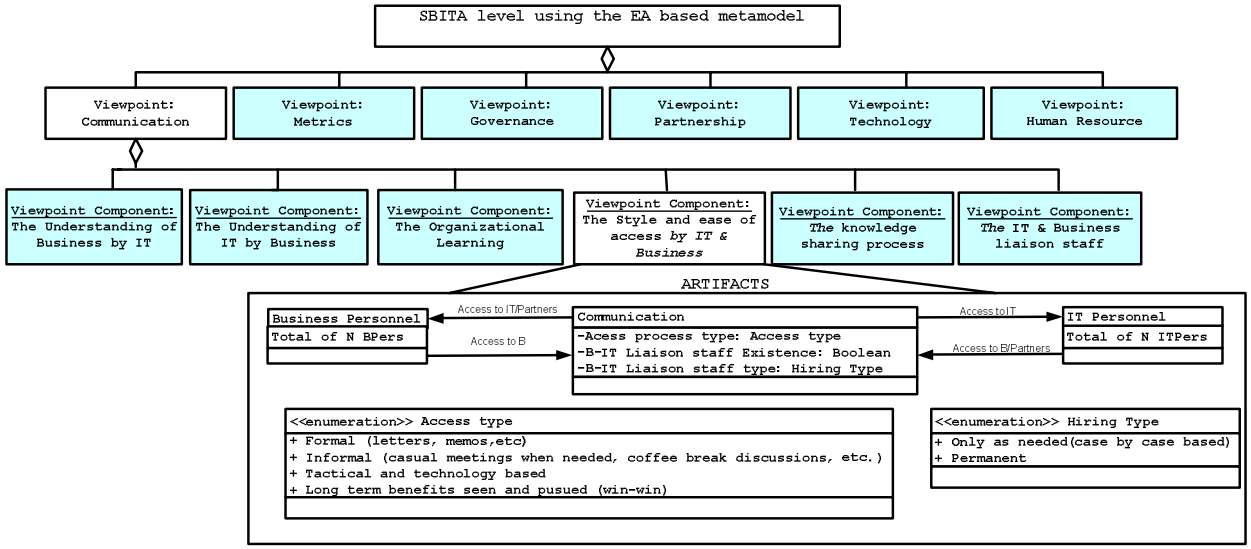

Figure 2. A partial representation of the metamodel

The alignment level is assessed by applying the inference rules of the metamodel to each View component, examples of which are shown in Table 1 for the *IT & B Liaison staff* Viewpoint-component. The alignment level is expressed on a Likert scale between 1, the lowest, to 5, the highest, according to the parental Luftman method [5]. The alignment level of each View is calculated as an average of the levels of the aggregated View components (criterion components) and the overall alignment level in an enterprise is calculated as an average of the alignment levels of the six Views (criteria) according to the Luftman method [5][6].

3. Case study design

Our research questions in this paper are: How can the proposed alignment assessment metamodel approach be applicable in enterprises? and What is the quality and use of the results of such application? To address these questions we conducted a case study designed with the phases shown in Figure 3 and further explained in this chapter.

3.1. The data to be collected and the survey tool

In order to apply the alignment assessment metamodel approach, a set of 71 questions was derived from the artifacts' attributes. This set of questions – the survey – allows the instantiation of the artifacts according to the attributes found in the surveyed enterprise. The instantiation as discussed in section 2.3 is the model that represent the enterprise's alignment level. A question-answer-artifact mapping document was made during the construction of the questions.

This document was the reference for defining the artifacts' data to be collected with a set of questions and its choices of answers. This mapping document is used later in the modeling phase for tracing back the answers collected (data) to the metamodel's artifacts to be instantiated.

The questions are closed ones with multiple choices. This construction of the questions was designed to enhance the objectivity, facilitate the data collection, replicate the survey sessions and facilitate the data processing. The survey consists of questions with:

- Documental choices: Subset of answers to be chosen by the personnel surveyed that requires direct documentary evidence. Documentary evidence found at the enterprise can provide answers in this choice without surveying the personnel (43% of the possible answers in the survey).
- Formal choices: Subset of answers to be chosen by the personnel surveyed that requires indirect documentary evidence (44% of the possible answers in the survey).
- Flexible choices: Subset of answers to be chosen by the personnel surveyed relying on personal knowledge or experience. (13% of the possible answers in the survey).

(Viewpoint component 1.6)
INPUTS
The instances of **B-IT Liaison staff**
The attribute **Frequency of existence**
The attribute **Access Type**
The attribute **Type of Scope**

OUTPUTS
IF the instance of ***B-IT Liaison*** has the attribute ***Frequency of existence*** and it is ***Never*** OR ***When there is a problem/needed*** THEN **Level 1**: *None of use only as needed.*

IF the instance of ***B-IT Liaison*** has the attribute ***Access Type*** and it is ***Tactical and technology based*** THEN **Level 2**: *Primary IT-B link.*

IF the instance of ***B-IT Liaison*** has the attribute ***Access Type*** and it is ***Formal knowledge sharing process*** THEN **Level 3**: Facilitate knowledge transfer.

IF the instance of ***B-IT Liaison*** has the attribute ***Access Type*** and it is ***Formal knowledge sharing process*** AND ***Long term benefits seen and pursued*** AND the attribute ***Type of Scope*** and it is ***At all level of the Organization*** THEN **Level 4**: *Facilitate relationship-building.*

IF the instance of ***B-IT Liaison*** has the attribute ***Access Type*** and it is ***Formal knowledge sharing process*** AND ***Long term benefits is seen and pursued*** AND the attribute ***Type of Scope*** and it is ***Include Partners*** THEN **Level 5**: *Building relationship with partners.*

Table 1. Set of inferences rules for the *IT & B Liaison staff* Viewpoint component.

Table 2 shows an example of a question with its choices (a) Documental choices (b) Formal choices, and (c) Flexible choices.

37. How do the IT personnel communicate with the other personnel?
(a) Using letters, memorandums, etc.
Yes ( ) No ( ) I don't know ( )
(b) During meetings or discussion with agenda or meeting minutes.
Yes ( ) No ( ) I don't know ( )
(c) During casual meetings or discussions when needed.
Yes ( ) No ( ) I don't know ( )

Table 2. Question 37 of the survey.

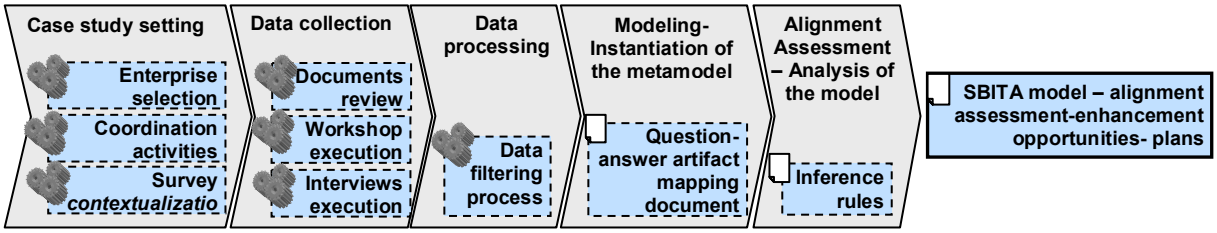

Figure 3. Case study phases

The survey was given to IT and non-IT related personnel in an academic institution and in a business consultancy company as a pilot test to check the clarity of the questions, recognition of the answer choices, and the applicability of the survey in personal interviews and in workshops.

From these tests we concluded that the questions needed some adjustment specially when referring to the specific organizational names and terms, e.g. the main IT person sometimes known as the *IT Director* in some institutions is the *Informatics System Officer* in the other one. A priori contextualization of the survey in the enterprise to be assessed is a need in this case study design.

3.2. Case study setting

Once the enterprise is selected, the case study settings included coordination activities and survey contextualization. The coordination with the enterprise management is needed to define and clearly authorize access to the documentation and to the personnel to be involved in the data collection phase. The workshops, interviews, and coordination meetings should be scheduled with the managers.

3.3. Data collection

The survey was designed to be used to collect data from documentary sources, workshops and person-to-person interviews. The number of workshops is defined with the enterprise management level to cover the enterprise's personnel as widely as possible. The workshop should be conducted with a prepared facilitator who could clarify any detail needed on the questions or answer choices.

The interviews are scheduled as an in-depth clarifying application of the survey as well as for cross validation of the data collected at the workshops. Documentary evidence is requested for every question.

3.4. Data processing

A *database* is generated from the data collected, which includes the questions asked, the answers, the participants involved in the workshops or interviews, and the name of the documents supporting the answers. This *database* is used to analyze the frequency of the answers and check the data sources, as well as ensure a good quality data collection as suggested in Yin, 1994 [21]. The *database* is used in the data filtering, based on the frequency of the answers and their reliability. Figure 4 depicts the *filtering* criteria. An arbitrary frequency of 70% of YES answers over the total collected answers for every choice has been defined as consensus criteria and thus for accepting a valid response to be analyzed further.

3.5. Modeling – Instantiation of the metamodel

With the question-answers-artifact *mapping document* enterprise's "as-is" alignment model, i.e. the instantiation of the metamodel, can be represented. The model of the "as-is" alignment is built with the data collected at the enterprise, as mention in section 2.3. The model should be presented to the personnel involved in the case study as a last validation stage and correction where needed.

3.6. Alignment assessment – Analysis of the model

With the alignment model and the inference rules, we derive the enterprise alignment level (a Likert scale between 1, the lowest, to 5, the highest, according to the parental Luftman theory) for each of the 38 View components of the model and then the alignment level for the Views by using the average value. The enterprise's overall alignment assessment is the average of the View levels, as mention in section 2.3. The alignment levels will be presented in histograms per View components and Views.

3.7. Alignment assessment – Planning enhancements

The enterprise alignment "as-is" model and the alignment levels per View components and Views represented in histograms, are the basis for recognizing what is the current status of the SBITA from the business and the IT perspective. With this basis, business and IT executives are enable to make an informed decision on which of the Views and View components set they both agree to enhance considering cost-benefits, market opportunities, technology opportunities, solution to spotted problems, etc.

Once an enhancement is agreed, i.e. to achieve a higher level of alignment, for a chosen set of View components an enterprise wide plan for improvements can be delineated according to the particular inference rules that prescribe the requirements to be achieved for the level of alignment aimed, i.e. "to-be" scenario. The full set of inference rules for each Viewpoint component can be seen in [16] and an example can be seen in Table 1.

4. Case study conduction and results

4.1. Case study setting

The enterprise selected for this case study is a nation-wide Internet Service Provider (ISP) in Nicaragua. This ISP offers high-speed Internet connectivity services over cable television including telephony (VoIP). It has an installed capacity for attending 100,000 clients and currently has 20,000 clients, most of them corporate clients. In the coordination meeting with the enterprise management 5 workshops and 5 interviews with business and IT personnel were scheduled. Weekly follow-up meetings were arranged among the top managers and the authors. A list of 11 enterprise's documents was selected and the time span for the data collection was defined as 4 weeks. A non-disclosure agreement was established between the case study team and the managers. The case study was planned and developed in 3 months.

4.2. Data collection

A total of 30 persons at the enterprise, working in the areas of IT, Production, Marketing, Accounting and Billing, were involved in the case study. The top-level enterprise managers were involved in the data collection phase during the weekly meetings.

4.3. Data processing

Using the *database* and *calculation and filtering* process described in section 3.4, the data collected was used for modeling 18% of the Formal choices, 10% of the Flexible choices and 9% of the Documentary choices.

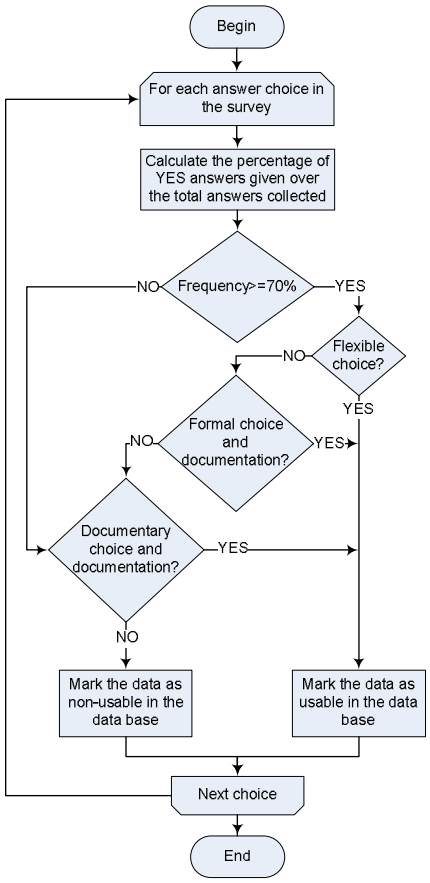

Figure 4.Data filtering process

4.4. Modeling – Instantiation of the metamodel

From the metamodel's 74 artifacts, 23 were instantiated (31%). The enterprise alignment model is presented in Figure 5, at the end of this paper.

4.5. Assessment – Analysis of the model

We derived the alignment level applying the inference rules to the Views and the Views components. Such levels are represented in histograms per Views and per View components. The histogram per Views is presented in Figure 6.

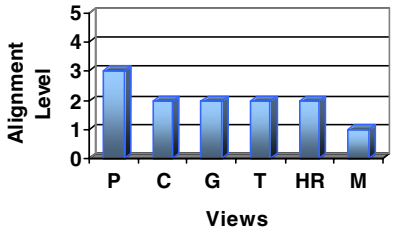

Figure 6. Histogram of the alignment levels at each View.

From the histogram the general results can be observed for each of the 6 Views:

- *Partnership* (**P**): Has an alignment level 3, i.e. IT is seen as an asset, and process driver.
- *Communication* (**C**): Has an alignment level 2, i.e. Limited mutual understanding between business and IT.
- *Governance* (**G**): Has an alignment level 2, i.e. Governance is tactical and in a functional level and occasionally responsive.
- *Technology* (**T**): Has an alignment level 2, i.e. The technology is used in information transactional processes.
- *Human Resource* (**HR**): Has an alignment level 2, i.e. The Human Resource capacity differs across the organization and is based in functional basis.
- *Metrics* (**M**): Has an alignment level 1, i.e. The metrics used in the organization are based merely in technical measurements.

In Figure 7 the histogram for the *Communication's* View components is presented.

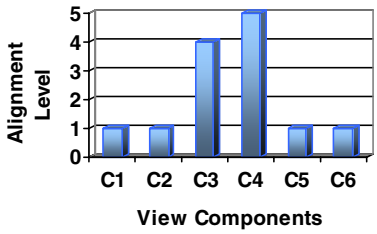

Figure 7. Histogram of alignment levels at the *Communication's* View components.

The histogram shows the general results for the *Communication's* View components:

- *Understanding of business by IT* (**C1**) has an alignment level 1, i.e. Lack of understanding of the business by the IT management.
- *Understanding of IT by business* (**C2**) has as an alignment level 1, i.e. Lack of understanding of the IT by the business management/managers.
- *Organizational learning* (**C3**) has as an alignment level 4, i.e. Use of formal methods sponsored by senior management.
- *Style and ease of access by IT & Business* (**C4**) has an alignment level 5, i.e. Existence of two-way business and IT access in informal and flexible process.
- *Knowledge-sharing process* (**C5**) has an alignment level 1, i.e. Existence of Ad-hoc knowledge sharing.
- *IT & Business liaison staff* (**C6**) has an alignment level 1, i.e. Non existent IT and Business liaison or existent only as needed.

The full set of histograms for this case study can be found in [19].

4.6. Alignment assessment –- An example of enhancement decisions and actions to be taken

As explained in section 3.7 the top-level managers can decide on alignment enhancement possibilities through the awareness of the levels above the current alignment. The enhancements, i.e. to achieve a higher level of alignment, are decided for chosen Views and set of View components. The requirements for higher alignment levels are prescribed in the inference rules of the metamodel. An example of such inference rules can be seen in Table 1 and the full set can be found in [16].

As an example, at the enterprise under study the View component *IT & Business liaison staff* has an alignment level 1, i.e. Non existent IT and Business liaison or existent only as needed. As it can be seen in Table 1 the inferences rules prescribe the requirements for higher alignment levels as follow: An enhancement to the alignment level 2 requires that the enterprise promotes a tactical link among the Business with the IT at every technological project. An increase to the alignment level 3 requires that the enterprise plans regular meetings with the Business and IT personnel/managers aimed to define and document technological projects opportunities in a common ground. An increase to the alignment level 4 requires that the enterprise plans regular workshops for strategic analysis, e.g. SWOT analysis, involving cross organization Business and IT personnel/managers. An increase to the alignment level 5 requires that the enterprise has liaison IT & Business personnel implementing regular workshops for strategic analysis involving cross organization Business and IT personnel/managers including the business partners.

The managers decided to enhance the alignment level to 5, i.e. Building relationship with partners. An action plan for such goal was delineated with the managers, the plan has the following main actions: (1)

Definition of the functions for the B-IT liaison role; (2) Decision on the organization position of such role; (3) Definition of the skills, training and experience needed and demanded for the role; (4) Decision on who is going to be responsible for the B-IT liaison role e.g. it's assigned to personnel already in the enterprise or it is a new job; (5) Allocation of a initial budget for the B-IT role; (6) Definition of the follow up and reporting process, with emphasis on the following indicators: (a) Number of meetings and workshops promoting effective communication and knowledge sharing among B-IT personnel and business partners, like the Internet global carriers, local loop services, etc. and (b) Proposals for business opportunities properly supported by current or new IT systems, including the business partners.

In a similar process the managers decided to enhance the alignment level for this year in 5 of the 38 View components and agreed on plans for each of such 5 goals at the end of this case study.

5. Lessons from the EA based alignment metamodel application

The application of the metamodel was done with a wide participation of the enterprise personnel; the participants represented each of the enterprise's organizational units.

The IT and B top-level managers were eager to participate in the survey and coordination meetings; actually it was the first time they had met to discuss and agreed upon strategic issues. At the coordination meetings with the top-level managers the alignment assessment was not seen as intrusive assessment, it was even seen as an extension of an assessment the enterprise recently conducted in the framework of the "Enterprise Excellence" [18]. Since some of the alignment assessment criteria were closely and easily related to such framework the case study was accepted with interest by the business managers.

At the presentation of the histograms with the current alignment levels, natural questions were raised about what the next levels would imply for the enterprise. This was done for the model's 38 assessed View components. Early improvement decisions were made by the enterprise managers during the coordination meetings when clear "weakness" was noticed, e.g. updating the enterprise's function and processes manuals. In general, the alignment assessment was done in a participative environment, most probably because the survey style asks for answers in an enterprise-wide environment, rather than looking for specific problems or responsibilities.

6. Conclusions

How to apply an EA based alignment assessment metamodel has been shown. The application was implemented in an intensive IT service enterprise and it was designed, carried out and documented as a replicable case study.

It has been shown that the knowledge and maturity already available in expert's approaches can be used for more focused, limited and relevant representations in the frame of the EA modeling endeavor. The proposed EA-based alignment assessment metamodel has the benefit of a limited set of 74 artifacts that can be modeled through 71 questions. These characteristics allow us to avoid over-modeling, have a defined and relatively short time frame for its implementation, and have tools suitable to collect the specific data needed.

The application of the metamodel shows that enterprise-wide surveys, the commitment of the top-level managers and close communication between the modeling team and top-level managers were key factors for a well received and appreciated modeling activity. The quality of the enterprise alignment model was validated with the enterprise managers and personnel of the alignment level assessed, although the histograms representations were the core input and reference in the discussions and decisions.

We assume that in order to draw more benefits of the EA model the organization needs to be committed to apply systematically and periodically the alignment assessment metamodel. In that way the enterprise will be more mature with a working EA-process allowing less effort, more accurate modeling than the first time construction, and more importantly to make informed decisions on plans based on EA models that can provide enterprise's "as-is" knowledge for reusability and impact scenario analysis.

With this approach the top-level managers can not only see the current enterprise alignment level but they can also make informed decisions on alignment enhancement possibilities through prioritization of the enhancements agreed among IT and B managers. The enterprises very seldom will have the possibility to enhance the alignment in all possible View components. Concrete plans for actions can be derived from the decisions taken and the approach here presented.

7. Acknowledgements

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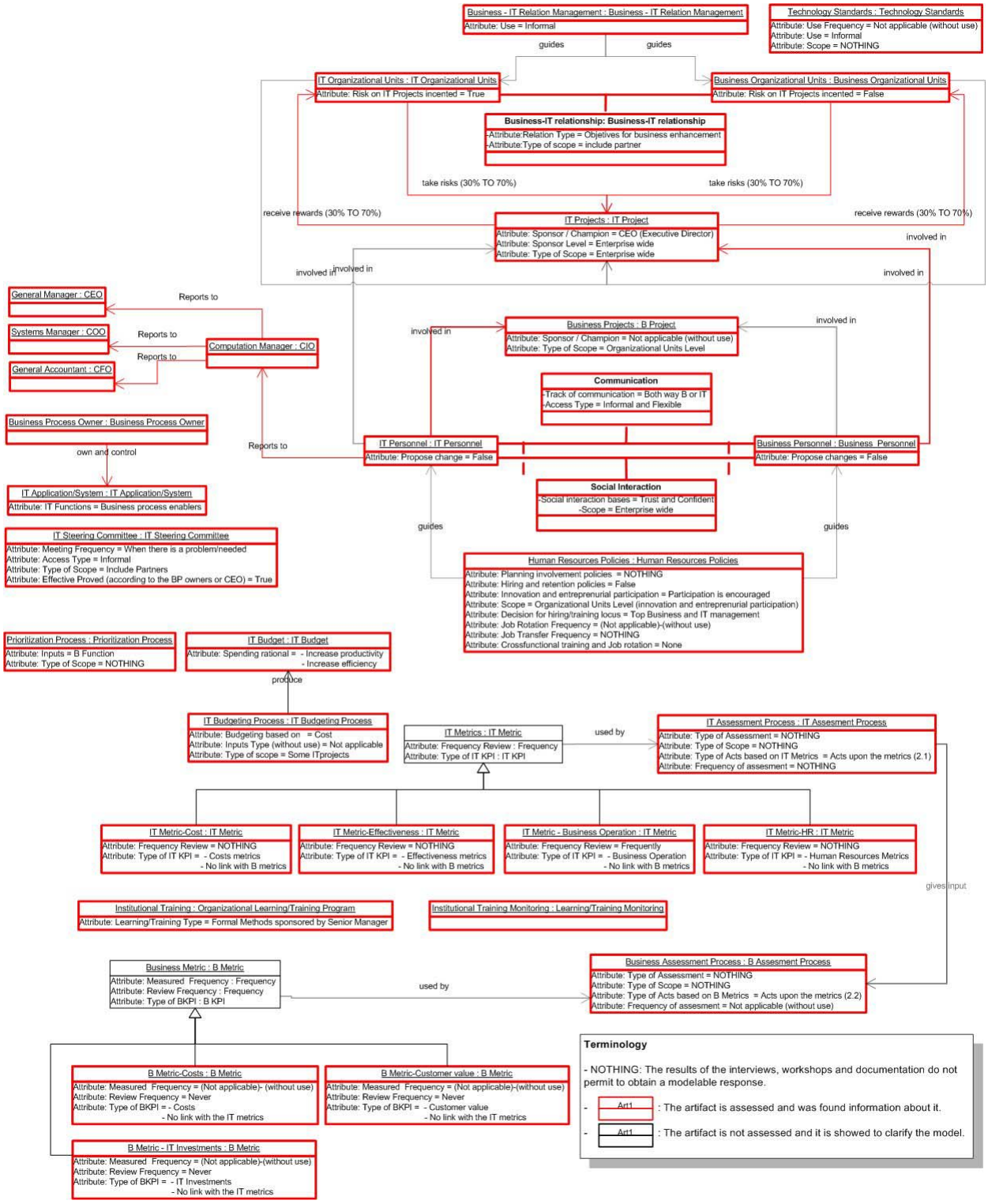

Figure 5. Enterprise's SBITA alignment "as-is" model.