

Information Driven Modeling: The Integration of Enterprise Ontology and Enterprise Architecture for the Mature BI

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Abstract. There is a huge interest in the area of engineering ontologies for a very wide range of applications. In modern enterprises and their business process management and decision making, modeling and Business Intelligence (BI) play a significant role. Information Technology (IT) contribution to business strategies and decisions has been questioned. The problem is not with IT, but with business complexity in modern times. The challenge of enterprise intelligence is a mission for the whole enterprise, and depends on intensive collaboration among organizational units. Enterprise BI requires new approaches, methods and tools focused on integration. BI must be part of Enterprise Architecture (EA). This paper offers a new insight on Business Intelligence. It proposes an extension of Archimate methodology in order to integrate EA and BI efforts with enterprise ontology to provide mature enterprise decisions.

1 Introduction

Business Intelligence (BI) is neither a product, nor technology nor methodology [24]. BI is a powerful management approach that can deliver knowledge, efficiency, better decisions, and profit to organizations.

BI initiatives can improve business performance in many ways, including better targeted products, improved customer relationship management, and greater operational efficiency. It can also result in reengineering of business processes.

When BI first came on the scene, it promised a lot but often failed to deliver. Despite the potential, success is not necessarily guaranteed. In fact, surveys revealed that more than 60 percent of companies with BI initiatives had only limited success in meeting user expectations. Studies also indicated managerial or business customer resistance to data warehousing for several reasons including the fear of losing control, lack of technical skills, costs, and uncertainty about their utility.

As the deployment of a BI system requires a multimillion-dollar investment and other resource mobilization, a well conducted project must take place. IT contribution to business strategies and decisions has been questioned but the problem is not IT, The problem is business complexity in modern times. Business Intelligence is one of

the most complex initiatives a company can have. It deals with many enterprise domains, each one with its own complexity.

First of all, BI projects are very complex. The challenge is how to control this complexity. BI initiative must have approaches, methods and tools that deal objectively with complexity. The challenge for enterprise is linking information to the organization strategic goals, culture, and strengths while tracking the technological and administrative complexity.

In spite of the increasing importance of BI, there is little interest in academic research about this subject. This lack of research limits our understanding of how BI projects can succeed. There are many open question related with BI: How we can take control of complexity in BI initiatives? How projects can be successfully conducted?

We can distinguish two major challenges in a BI project, each one with its own complexity: a business and a technical challenge. This paper makes an exploratory study to enhance general understanding of BI Projects, but the main focus is to explore business variables related to BI success, specifically at the enterprise modeling stage. The paper proposes that good enterprise models can reduce the complexity of business side of BI projects. It explores the influence of information and ontology in enterprise modeling and proposes a new approach of modeling the enterprise based on information modeling. This proposal extends Archimate language, a new approach on Enterprise Architecture (EA). The contribution of this paper is a proposal that reduces drastically the business side of BI projects by presenting a methodology that supports the modeling and understanding of business.

This paper is organized as follows: session 2 discusses the BI benefits and challenges. Session 3 looks at complexity in business and technology. Session 4 explores information modeling and ontologies: its evolution, contribution and challenges. Session 5 studies the evolution and challenges of enterprise architecture. Session 6 resumes the relation of BI with enterprise wide modeling. Session 7 makes a proposal of extending the Archimate language in order to support information and ontology approaches. Session 8 shows an application of this approach being conducted in a insurance company, Finally, session 9 presents a conclusion and propose future works.

2 Business Intelligence Concepts and Challenges

BI is neither a product nor a system. It is an architecture and a collection of integrated operational as well as decision-support applications and databases that provide the business community easy access to business data [24].

There is much to say about BI concepts, finality, methods and technology. For those interested in business and technical side of BI we recommend Larissa Moss' [13] and Steve Williams' [24] books. We highlight some considerations made by the authors:

- BI presents many benefits. It can increase sales, reduce costs and increase profits.
- BI requires preconditions for success. There are Business preconditions, like strategic alignment, process engineering and change management, and

technical preconditions like BI technical development and BI project management.

- BI requires a methodology with many steps, like business analyses, data base design and implementation and ETL design and implementation.
- Producing reliable information is the ultimate goal of BI. The ocean of data created with the advances of science and technologies call for integration of data coming from heterogeneous sources that are diverse in their purposes.
- BI is a collaborative project and needs the participation of application lead developer, business representative, data Administrator, data quality analyst, database administrator, ETL lead developer, meta data administrator, project manager and subject matter expert.
- BI presents a great rate of failure and users dissatisfaction.
- In order to reach success, BI projects must have some essential abilities: (1) ability to align and govern strategic alignment, business-IT partnership and BI portfolio management; (2) ability to leverage cultures like information and analytics use, continuous process improvement and decision process engineering and (3) ability to deliver technologies like DW and BI software.

Concluding, Enterprises are complex, technology is complex and BI is a complex project. IT projects comprises business and technological sides. Rate of failures are high. Business and IT must collaborate to BI success.

3 BI and Enterprise Maturity

BI is an initiative of great proportions. Taking its characteristics, perhaps BI can be considered the enterprise initiative that depends most on the integration between business and IT. BI project has few chance of success when we do not have enterprise and IT maturity and when the relation between both is not also mature.

Enterprise maturity is a subject much discussed in literature with a well established proposal standard like CMMI [4]. Maturity is related with the capacity of coordinating continuously improving results. Maturity is provided by repeatable, well-defined and managed programs.

IT maturity also presents standards, like COBIT [5] and ITIL [11]. COBIT is related with IT governance and consists on leadership, organizational structures and processes that ensure that the enterprise's IT sustains and extends the organization's strategies and objectives. ITIL is a library of good practices for IT services.

Chen [1] proposes a framework for understanding Business-IT Alignment. He identifies the alignment approaches: alignment via architecture, alignment via governance, and alignment via communications. These three approaches are integrated in the BITAM-SOA Framework depicted in Figure 1.

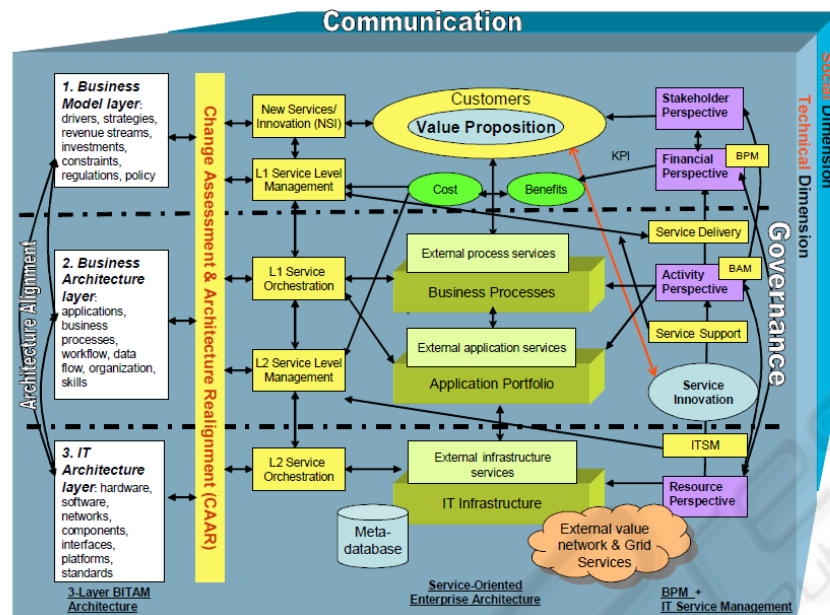


Fig. 1. BITAM-SOA Service Engineering Schematic [2].

Cumps, Viaene and Dedene [7] identified the following approaches IT must have in order to contribute to Business-IT Alignment:

- Change management
- Strategic IT planning
- Risk management
- Enterprise architecture management
- Performance management
- Program/portfolio management
- Service-level management
- Project management

Concluding, enterprise maturity, IT maturity, and Business-IT alignment are preconditions of success in BI projects because it is almost impossible to succeed without IT governance and good practices and well defined and managed enterprise wide programs.

4 BI, Information Modeling and Ontologies

BI is related with enterprise intelligence and so it is related with data, information, knowledge and ontologies in enterprises. Enterprise Information modeling and ontologies are attracting attention of researches [20].

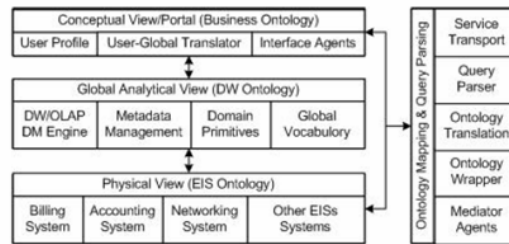


Fig.4. Ontologies and information systems [20].

Concluding, ontologies can be of great value for BI projects helping understanding the business by defining its main elements and showing the relation among them.

5 BI and Enterprise Architecture

BI is related with business and technology. So it demands models from business and from technology and models showing the relation between both. EA is the discipline that studies these kind of enterprise wide modeling.

We can find many researches about Enterprise Architecture (EA). For those interested on the foundations, methods, languages and tools of EA we recommend Lankhorst' [17], Ross' [21] and Weske' [23] books. Follows a resume of EA from these authors:

- EA defines a firm's needs for standardized tasks, job roles, systems, infrastructure, and data in core business processes.
- EA is a coherent whole of principles, methods, and models that are used in the design of an enterprise's organizational structure, business processes, information systems, and infrastructure.
- EA identifies the main components of an organization and how they work together to achieve defined business objectives.
- EA models components include personnel, business processes, technology, financial information and other resources.
- Business and IT communities need to share a common understanding of the principles underlying enterprise modeling.
- While administration professionals tend to consider information technology as a subordinate aspect for experts to handle, by contrast computer scientists often consider business goals and organizational regulations as terms that do not deserve much attention.
- EA include high-level business aspects like business goals, strategies, and value chains and also technical models, taking into account the different stakeholders involved as figure 5 shows.
- EA can use a variety of process languages, including Workflow nets, Event-driven Process Chains, Yet Another Workflow Language, and the Business Process Modeling Notation.

- EA can have a specific language like Archimate (Figure 6).
- The lack of a pattern difficult the maturity of the process.

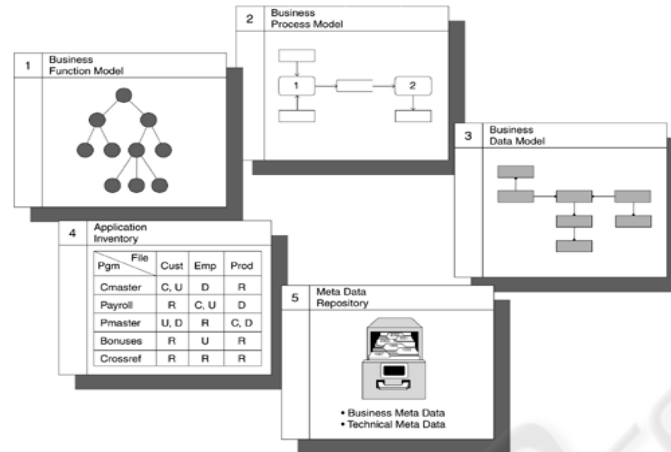


Fig. 5. EA models [18].

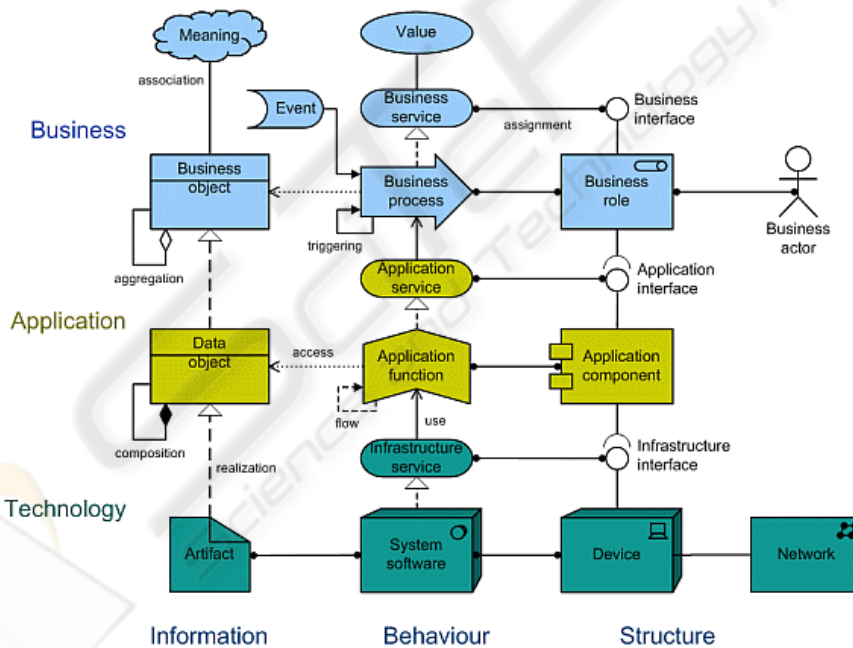


Fig. 6. Archimate Language [17].

EA provides enterprise wide models of business, information, systems and technology. It is an essential part of business side of BI. So, we can conclude that having an EA program, we have enterprise knowledge and BI is likely to succeed.

6 A Mature BI Business Side

The main purpose of BI is to provide support to enterprise decisions. BI presents business and technological sides. In previous sections we analyzed many business sides like enterprise maturity, IT maturity and enterprise wide modeling efforts like EA and knowledge modeling.

We found some related works at literature linking EA with BEA [22] [23] but they are not information driven and do not use Ontologies. Considering the state of the art of BI, data modeling, information modeling, knowledge modeling, enterprise modeling, ontologies and EA we find they have much in common and must collaborate. We can summarize our analyses in the following remarks:

- Business side of BI must have strong sources of Knowledge about enterprise objects.
- Information and knowledge models approaches are evolving in enterprise side and can provide sources of knowledge about enterprise objects.
- Enterprise wide modeling is evolving, with the maturity of EA methodology and tools that can help business people understand the enterprise objects.
- Enterprise mature approaches can provide the environment BI needs to succeed in its business side.
- IT mature approaches can provide the technical environment BI needs to succeed.
- Business-IT alignment mature approaches can provide the global environment BI needs to succeed.

Enterprise wide models are evolving and we need studies analyzing the impact of it in organizations. All the remarks above are related with BI projects, based on theory and must be proved with case studies. We suppose organizations do not have sufficient practice for a large survey so we must validate this theory in a case study. We have intention to make this study but first we need an integrated approach to BI which is given in the next section.

7 Information Driven Modeling: EA for BI with Information Modeling and Ontologies

Enterprise Modeling needs a language to integrate enterprise objects. We have many modeling languages for specific purposes. When talking about modeling enterprise objects we can find ontologies languages like OWL. EA approach tries to consolidate different models in enterprise frameworks. A specifically language for EA called Archimate has recently appeared.

We have found Archimate a good methodology for EA that can be also a good contribution to BI. But we propose to extend Archimate for information and business strategies modeling.

Figure one shows our proposal of Archimate extension. It presents the following elements that Archimate does not consider:

- Information activity;
- Control;
- Decision;
- Mission, goals and strategies

This proposal is based on information. What drives analyses is information activity. We identify an information object and then its activities. It brings MER to business, identifying information entities, information activities and establishing information relations with all business objects.

The benefit of this approach is that is easier for people to understand. Figure 7 shows the proposal of Archimate extension.

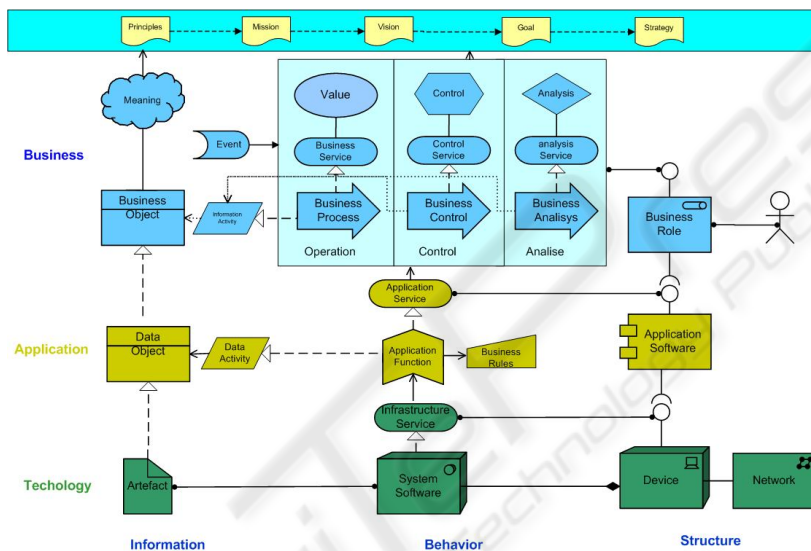


Fig. 7. Archimate extended.

8 A Case Study

We are applying the approach described in a big insurance company in Brazil that has a BI project in one of its units. This Unit comprises more ten million clients, twenty million contracts and two millions transactions monthly. The BI project is very complex in business and technical side.

In business side the complexity was reduced by adoption or the Archimate methodology extended with the information approach. This method helps to identify information and its relations ant also the relations of each information activity to strategies, controls and operations.

With the use of Archimate (by a Vision stencil) people can easily understand also the relation of information with data in the application and in the datawarehouse. With protégé people can see the information defined and its relations.

Figure 8 shows a information object, its activities and each relation with operations, controls and decisions. Figure 9 shows protege and information relations. Figure 10 shows information relations with data.

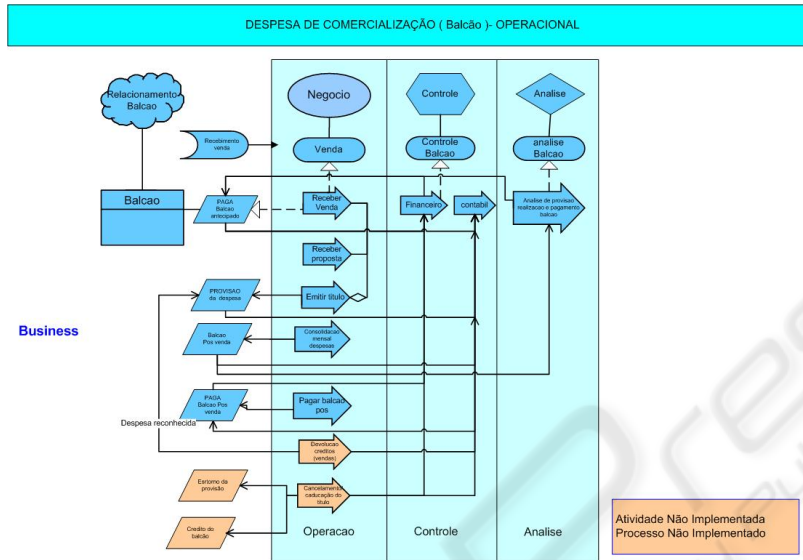


Fig. 8. Information and business relations.

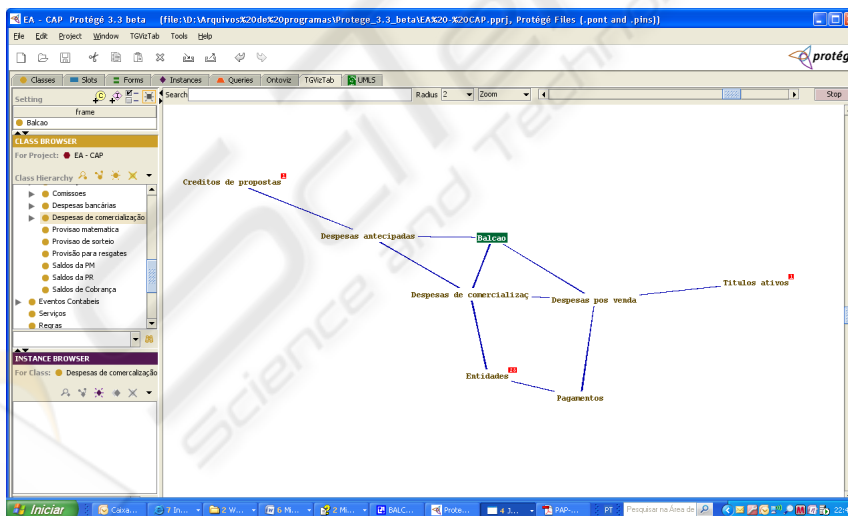


Fig. 9. Information and its relations.

tools must be better integrated better. Ontologies tools need to be integrated with ea tools.

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