# ESWIS Proposal Paper

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| **Tentative Title** | How is IT contributing to value generating activities? A proposal of an ontology based approach |
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# Abstract

*Evaluating IT resources impact on value generating activities is hard since IT can affect more than one business process. IS literature highlights the importance of linking IT resources to value generating activities and business processes, to fully exploit value delivered by IT. Anyhow literature proposes, so far, no methodologies to tackle this problem. This proposal paper mixes together two streams of research (IT Business Value and Business Model research) adopting a common theoretical perspective (RBV) to provide an ontology based methodology to evaluate IT resources impact on value generating activities. The proposed methodology integrates the Business Model ontology with the OLPIT ontology. The proposed approach offers the opportunity to evaluate IT resources impact on value generating activities by means of IT services. Potential benefits of this approach would be the: identification of key IT resources, identification of IT resources affecting activities, identification of revenues/costs that can be accounted to IT resources.*


## 1. Introduction

The impact of IT resources on value generating activities is hard to evaluate since IT can affect several business processes (Scheepers and Scheepers 2008, Tallon 2007). IS literature highlights the importance of tiding IT resources to value generating activities to fully exploit value delivered by IT (Tillquist and Rodgers 2005), suggesting to integrate the IT perspective with the business perspective (Serrano and Hengst 2005), by means of business processes. The adoption of such a holistic perspective requires the definition of a methodology to link IT resources and activities (Scheepers and Scheepers 2008), still absent in literature.
By combining together two different streams of research (IT Business Value and Business Modelling) this paper proposes an ontology based approach to address the described problem. The research question this paper is based on is the following:

*How is it possible to model, represent and communicate relationships among IT resources and value generating activities in a firm?*

The ontology based approach was chosen to reuse and extend a model available in literature (the Business Model Ontology) and to overpass the problem linked to the sharing of a mutual understanding between the business and the IT (Ray et al. 2007).
The structure of this paper is as follows: § 2 describes the theoretical framework; § 3 describes the research motivation of the proposed approach, § 4 describes the research design and methodology, and § 5 contains some conclusions. Appendix A, at the end of the text, contains a progress report of the research.

## 2. Theoretical Framework

The two streams of research combined in this paper are IT Business Value (ITBV) and Business Model (BM) research. Although separated, they find a common contact point in the Resource Based View (RBV) of the firm (Wernefelt 1984) which constitutes the main theoretical foundation of this paper. According to the RBV, firms possess resources, a subset of which enable them to achieve competitive advantage. The resources addressed in this positional paper are IT resources, and IT is referred to as the "Tool" view described by Orlikowski and Iacono (2001).

ITBV research examines the impact of IT on organizational performance (Melville et al. 2004) to evaluate profitability and effectiveness of IT investments (Seddon et al. 2002). To address this problem, literature has used several approaches (Melville et al. 2004) and theoretical perspectives (Oh and Pinsonneault 2007), producing controversial results (Im et al. 2001), since both the positive and the negative sing of the relationship between IT investments and performance has been sustained (Wagner and Weitzel 2007). On the base of this circumstance Kohli and Grover (2008) point out the need to create a discontinuity in the ITBV research field favouring the adoption of new approaches that could give further insights on this topic.

Recently there is a growing acceptance of the importance of analyzing ITBV from a process based point of view (Tallon 2007) noticing that IT application tends to be process specific (Ray et al. 2007). Melivelle et al. (2004) identified that one of the locus where IT produces value is the focal firm (intended as the firm that performs the investment). At this level IT resources interact with complementary organizational resources contributing to organizational performance by means of business processes and business processes performance improvements. Identifying value delivered by IT resources to business processes requires the classification of the former into the latter (Wagner and Weitzel 2007), linking resources to activities (Tillquist and Rodgers 2005).

Working towards this perspective, Scheepers and Scheepers (2008) propose to identify value generating activities relying on Porter's value chain (Porter 2001). This approach is anyhow limited as the value chain framework only describes the value generation process of an industrial firm. Therefore, to adopt a more general approach, value chain framework extensions (Stabell and Fjeldstad 1998) like value shops (used to describe the value generation process of service providers) and value networks (used to describe the value generation process of a brokering and an intermediary activity) have to be taken into account.

The identification of value generating activities in a firm is commonly addressed by the theoretical concept of "Business Model" (Magretta 2002, Bienstock et al. 2002). Literature on this topic already produced a modelling tool to represent relationships among value generating activities and firm resources (Osterwalder et al. 2005).

Since the BM is a borderline concept analysed by many disciplines that define it in many different ways (Braccini et al. 2008), the model proposed is an ontology that, besides representing relationships among value generating activities and resources, no matter which is the value configuration adopted, also contains semantics to share the same concept among all subjects involved.

| Pillars and Building Blocks of the BMO | | |
|---|---|---|
| **Pillar** | **Building Block** | **Component** |
| Product | Value Proposition | Offering |
| Customer Interface | Target Customer | Criterion |
| | Distribution Channel | Link<br>Actor |
| | Relationships | Mechanism |
| Infrastructure Management | Value Configuration | Activity<br>Actor |
| | Core Capability | Resource<br>Actor |
| | Partner Network | Agreement<br>Actor |
| Financial Aspects | Cost Structure | Account |
| | Revenue Model | Revenue Stream and Pricing |

**Fig 1.** Class hierarchy of the BMO[1]

The proposed ontology, called Business Model Ontology (BMO) (Osterwalder et al. 2005), represents a BM as composed by four pillars and nine building blocks. Each building block can have one or more components associated to it. Fig. 1 and fig. 2 show the structure and the relationship among BMO components. The ontology also defines properties and relationships among pillars and building blocks that are not reproduced here due to lack of space.

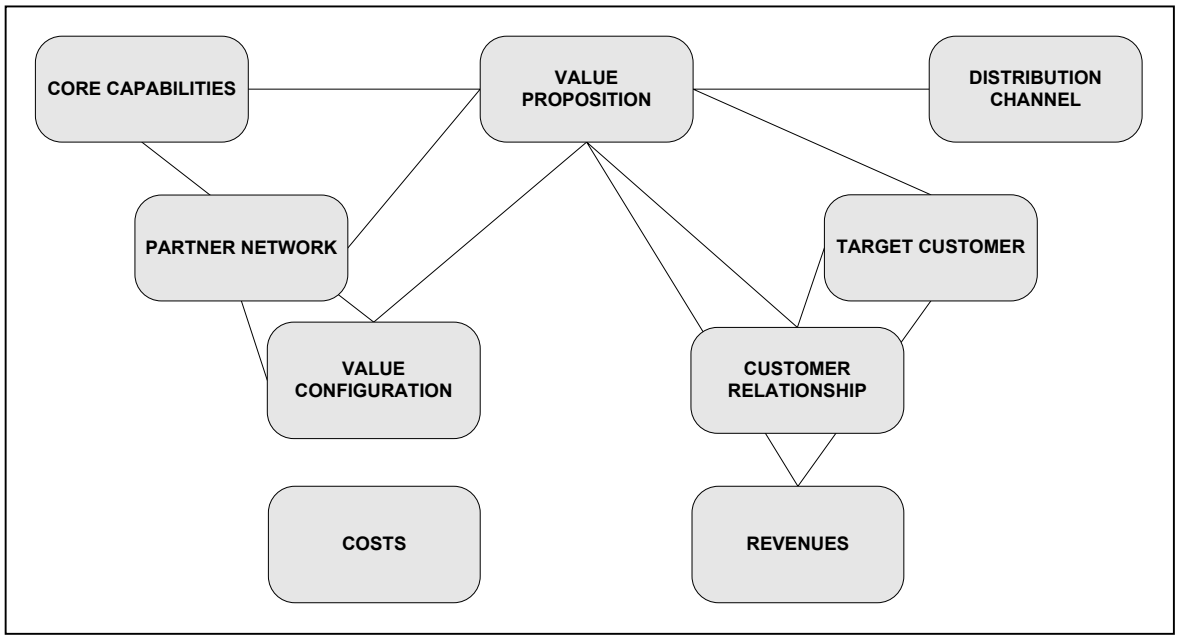


**Fig 2.** Pillars (and their relationships) of the BMO

[1] For readability reasons, properties and attributes of each class have not been included in the picture.

## 3. Research Motivation

The ITBV research highlights the need to evaluate IT investments impact at the business process level, focusing on value generating activities, by linking them to IT resources. So far, the literature has proposed no holistic models for such a purpose.

On the other side, the BM research proposes an ontology to model relationships among value generating activities and resources. Among all the constructs of the BMO, the Resource and Actor components can be used to model this relationship. Anyhow, this approach is not consistent with established best practices of IT management (contained in the ITIL v 3 and COBiT v 4.1 international standards) that see IT as a service provider. The BMO by itself has therefore no constructs to model services by means of which IT resource deliver value to the business.

To solve this issue, the BMO has been extended and a new ontology called OLPIT (vom Brocke et al. 2009) has been developed during the PhD project this paper refers to. The OLPIT ontology builds on the ITIL v 3 and COBiT v 4.1 frameworks in order to consider best practices in IT management. In the OLPIT ontology IT resources deliver value to activities of a business process by means of services (fig. 3).

The integrated ontology based approach is proposed for two reasons. First of all ontologies are nowadays commonly used as generic instruments to represent and exchange knowledge (Guarino and Musen 2005). Ontologies depict semantic relationships among concepts derived from the domain of interest that has to be clearly understood by all parties involved (even by non-human actors). An ontology can be used to model a reality, and to communicate and share the same concept among different subjects involved. The second reason is linked to the opportunity of reusing an already available ontology, extending it to model further aspects of the reality without the need to reinvent the wheel.

The integrated BMO + OLPIT approach can allow a firm to:

- identify which IT resource affects which activity;
- identify unexploited IT resources;
- better communicate IT contribution to the business activity (also by means of a service catalogue);
- identify which portion of revenues/costs can be accounted to which IT resource;
- identify strategic IT resources.

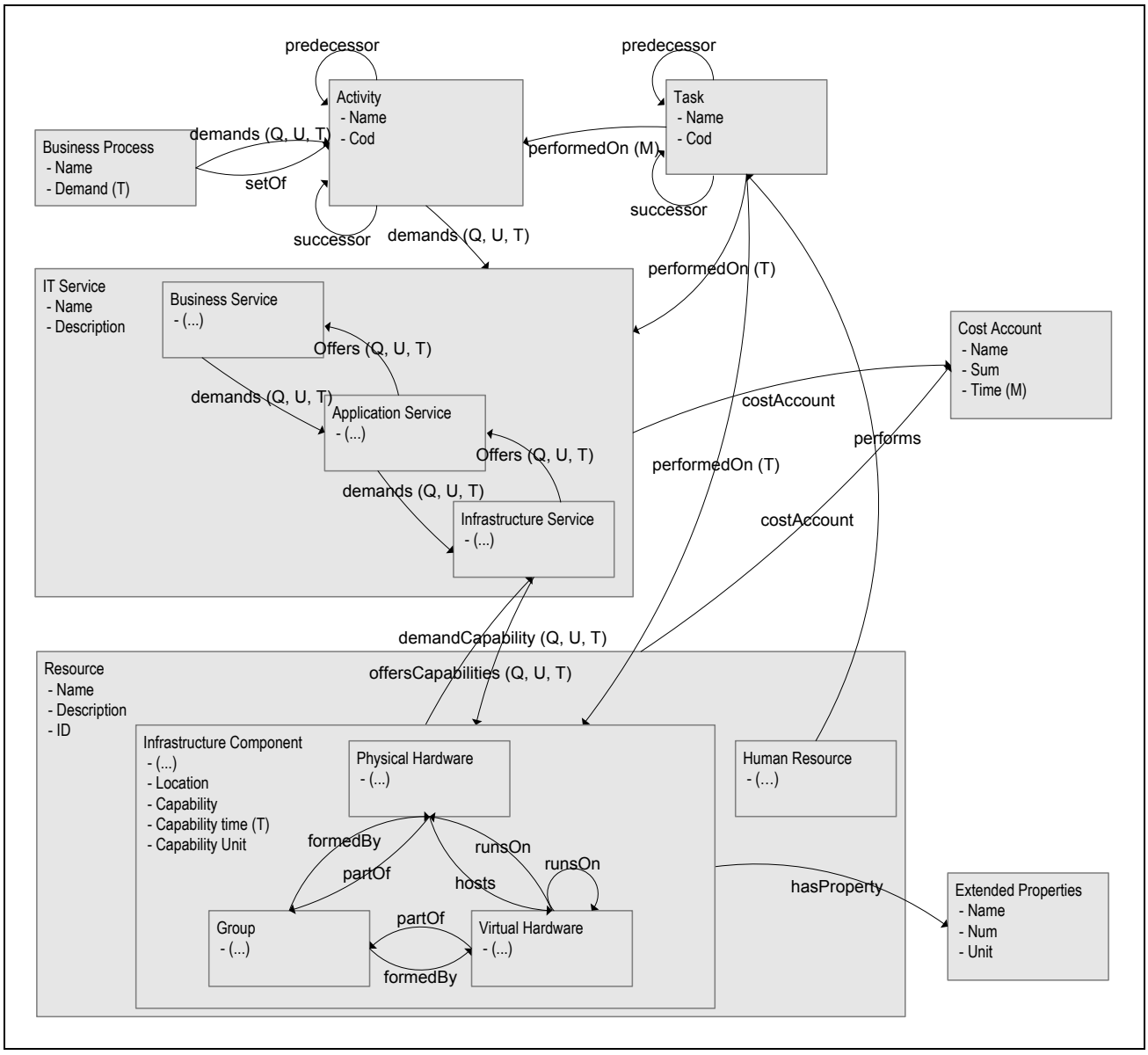


**Fig 3.** The OLPIT ontology (vom Brocke et al. 2009)

# 4. Research Design and Methodology

The research described into this proposal paper is divided in two phases. The first phase (already completed as indicated in the progress report) was focused on the identification of established methodology, available in literature, to model the impact of IT resources on value generating activities and its consequent test on a real life context. This phase led to the identification of the BMO. The application in the real life environment shown the limits of the BMO when used for such purposes. Therefore the second step was focused on the feasibility, the development and the test of an ontology to extend the BMO to model IT impacts on value generating activities.

The methodological aspects of the two steps are described in the following sub-paragraphs. To overpass the limit of past ITBV research that offers few practical applications of proposed methodologies (Leem et al.

2004), this research has been (and will be) based and tested, as much as possible, on real cases and real contexts.

## *First step: the identification and the use of the BMO*

The first step was centred on the identification of methodological approaches available in literature to model IT impacts on value generating activities of a firm. The BMO has been identified by means of a literature review. Afterwards the BMO has been tested for eight months in a participatory action research study during the exploitation phase of the LD-CAST European project (Braccini et al. 2008). The project consortium (formed by universities and research institutes, IT partners and Chambers of Commerce of Bulgaria, Italy, Poland and Romania) worked for three years in the definition of requirements, the design and the implementation of a prototype of a semantic technology based platform allowing Chambers of Commerce to offer cross-border e-services to private companies. During the exploitation phase of the project, the project Consortium had to find a suitable exploitation strategy for the developed technology. The BMO was used to model the BM of the entity that has to run the platform when the project goes live. The BMO was used in interviews, focus groups and meetings among all the parties involved in the project.

This activity adopted a participatory action research approach. According to Baskerville (1999) action research is a set of research approaches, with a pragmatic foundation (Baskerville and Myers 2004), which is considered a better strategy to investigate the organizational impact of information systems (Aviston et al. 2001). In action research projects, research cooperate with domain actors (or experts) to solve practical problems, expanding, at the same time, their scientific knowledge (Baskerville and Myers 2004). Participatory action research expands the action research approach promoting domain actors to the "co-researchers" status, and extending to them the responsibility of theory formulation (Baskerville 1999).

## *Step number two*

The second step focused on the feasibility, the development and the test of the OLPIT ontology to extend the BMO. The OLPIT ontology has been developed and tested for five months in the context of the IT division of an international tool producer company. The company (called Eurotool in this document) manages, in three strategic locations worldwide, global IT services to support sales and customer relationships of its market organizations (located in more than 120 countries worldwide). The project aimed at improving IT infrastructure management to plan decisions on IT investments, to internally and externally benchmark IT activity and to better communicate IT contribution to business.

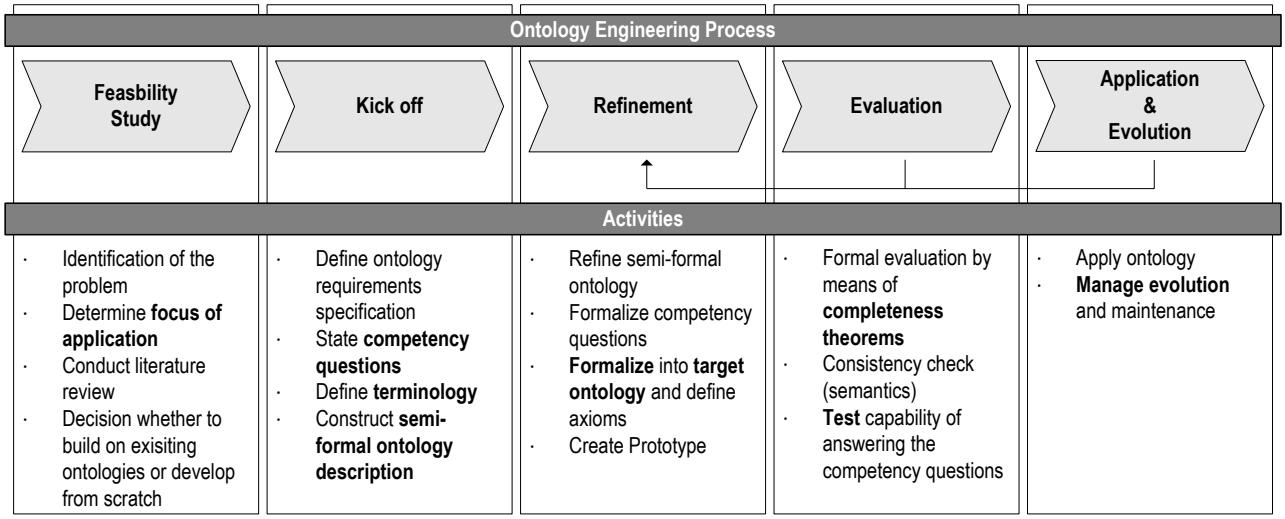


**Fig. 3.** Ontology Engineering Process

The ontology has been developed following the approach used by Sure et al. (2003) and Fox et al. (1998) which is depicted in the fig. 3. The methodological approach is the one of the design science research (Hevner et al. 2004) which involves the analysis of the use and performance of designed IT artefacts. In this case the "IT artefact" is the OLPIT ontology. According to guidelines given by Hevner et al. (2004) existing foundations and methodologies taken from the literature and from the practice, forming the knowledge base, have been used to design the ontology.

The ontology has been modelled with the OWL 2.0 language, including knowledge coming from ITIL v 3 and COBiT v 4.1 standards and also knowledge coming from real life scenarios. The ontology has been evaluated and refined by means of test cases based on real life examples. The ontology was validated during several meetings with key stakeholders in the IT division of Eurotool.

# 5. Conclusions

On the base of the need to introduce a discontinuity in ITBV research (Kohli and Grover 2008), by proposing new approaches to get further insights on this phenomenon, this paper contributes to IS research proposing an holistic approach to represent, model and communicate IT resources impacts on value generating activities in a firm. The proposed approach is based on the integration of the BMO with the OLPIT ontology to derive an holistic model of IT resources and value generating activities that can allow firms to:

- identify which IT resource affects which activity;
- identify unexploited IT resources;
- better communicate IT contribution to the business activity (also by means of a service catalogue);
- identify which portion of revenues/costs can be accounted to which IT resource;
- identify strategic IT resources.

Even if the proposed approach stems from a real context and addresses the solution of a practical problem, it has not been thoroughly tested yet, since the research is still in progress. This is the first limitation of the proposed approach, therefore further testing activity will help in confirming or confuting expected benefits.

# Appendix A - Progress Report and Publications record

| Research Activities | | | |
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| Step | Activity | Description | Status |
| 1 | Literature review | Identification of methodologies available in literature to model, represent and communicate the Business Model of a firm (BMO) | Completed |
| 1 | Application | Application of the BMO to the exploitation activity of the LD-CAST European Project | Completed |
| 1 | Learning | Lessons learnt from the application of the BMO to the LD-CAST context | Completed |
| 2 | Domain analysis | Identification of the issues affecting the business reality | Completed |
| 2 | Feasibility study | Feasibility of the adoption of an ontology based approach to tackle the problem stemming from the business reality | Completed |
| 2 | Ontology Development | Development of the OLPIT Ontology | Ongoing (65% completed) |
| 2 | Ontology Test | Test of the OLPIT Ontology in a real organizational environment | Ongoing (50% completed) |
| 2 | Test of the integrated approach | Test of the integrated ontology (OLPIT + BMO) to model a real business case scenario | Ongoing (5% completed) |

**Tab. 1.** Progress report (15/03/2009)

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