

An Explanatory Design Theory for a Controlling System for IT Investments Performance Evaluation

Abstract. The business investments in IT show a stable growth even though the international financial crisis stopped them for quite a small period of time. Still, the evaluation of IT investments impact onto business performance remains a low-structured problem and very often represents an expert, qualitative and not formalized procedure. From this point of view this research in progress paper presents the approach to the design and the development of an IT investments controlling and performance measurement instrument. It adopts a design research perspective and, at the current stage of research, discusses only a descriptive design theory of such instrument.

Keywords: IT Investments Performance Evaluation, Business performances, IT Controlling, Explanatory Design Theory

1. Introduction

Firms invest every year billions of dollars in Information Technology (IT) infrastructures. The worldwide total IT spending in the past five years was stable above 3.000 USD billions [1]. The total IT spending was obviously affected by the recent financial crisis but after two years of recession, the IT spending started to show again a positive growth rate in 2011. Different studies forecast different growth figures (i.e. 2% in [2] and 5% in [3]), but they all agree on the fact that the IT spending will be increasing in 2011. Many experts (Russians are not the last ones) even state that last year the crisis in IT sector was completely overcome.

In the United States in 2009 almost the half of the total means allocated for the realization of the ARRA (American Recovery and Reinvestment Act) bill (\$ 74.2 billions) was addressed to the IT sector. The execution of this law permitted to save 600 thousands of workplaces and arise the GDP by 5,7% [4]. According to Gartner's survey 48,2% of IT investments in Europe in 2012 will be realized in the corporate IT sector, which underlines once again the importance of this activity for business and indicate that IT continues to be regarded as a critical resource that leads to organizational value.

In spite of the expenditures and of the relevance that IT investments play in many nowadays organizations, the actual contribution in terms of value that IT investments deliver to the organization is not always known, sometimes it is elusive, and other times it is taken for granted [5–7]. IT investments are run to build IT infrastructures that are commonly used in business activities to compute, store, and transmit digital information [8], supporting both operational and managerial processes. The complexity of nowadays IT infrastructures makes it difficult to identify a precise impact of IT investments on organizational performance [9, 10]. Nonetheless organizations invest in performance measurement systems to equip themselves with

tools to support investments decisions [11], and are in the continuous search of controlling systems to assess the benefits derived from their IT investments[12].

However, as Kohli and Devaraj state [13] this assumption has not always been shared by functional business managers. CIO's often complain that IT is not given the opportunity to shape business strategy. For their part, business managers – CEO, COO and CFO – charge that IT managers do not always understand the nature of the business and, instead, focus more on the technology. The reality is that payoffs from IT investments are not just the responsibility of the IT function. Each constituent who uses IT or is involved in the value generation shares responsibility for aligning IT with business functions. The shared understanding among IT and business regarding IT investments matters is crucial in the IT value achievement [14].

Michael Porter, one of the most known scientists in the field of business strategy states that the companies must come back to the usage of IT as a part of corporate strategy and not to analyse it as an internal operation [15]. Certainly, IT-specialists must also know the customer, understand the production process and have a business sight on company's functioning. Since, from the practical point of view, the decision of a company to invest in IT-technology is usually non-formalized and represents the result of an expert evaluation or the ability of IT managers to convict the chief managers in its importance in the complex strategic plan of business development.

Given these premises this paper presents a research proposal devoted to the design and the development of an IT investments controlling and performance measurement instrument as a tool to assess IT investments performance and to support IT investments decision making processes. The paper adopts a design research perspective and, at the current stage of research, only discusses a descriptive design theory for such instrument. The paper unfolds as follows: section 2 provides the necessary methodological information and describes the design research perspective, section 3 discusses the kernel theories pertinent to the research proposed, section 4 discusses instead an explanatory design theory for an IT investments performance measurement and controlling system. Some brief considerations will conclude the paper in section 5.

2. Research Methodology

This paper follows a design research approach as a methodological guidance. It represents a first step towards the definition of the requirements of an IT investments controlling and performance measurement instruments.

Regarding the design research methodology, in an attempt to structure a design research effort, Walls et al. proposed in an article of theirs [16] a skeletal structure of a design theory. According to them both (a) a design product, and (b) a design process are the necessary components of a design theory. The design product is further decomposed in meta-requirements, meta-design, kernel theories, and a set of testable design hypothesis. The design process is instead decomposed in the design method, the kernel theories, and a set of testable design process hypothesis. Gregor and Jones later extended Walls et al contribution proposing a framework for design theories

based on fewer components [17]: kernel theories, meta-requirements, meta-design, design method, and testable design produce and process hypotheses.

In this framework the kernel theories are at the core of a design research effort. The kernel theories form the necessary justificatory knowledge that informs the design process and provides explanations for the process itself. Such theories are the foundations on top of which prescriptions for meta-requirements, meta-design, design method, and testable design product and process hypotheses are formulated. In this framework the meta-requirements are the set of goals to which the theory applies. The meta-design is instead the abstract blueprint or architecture that describes the artifact. The meta-design can either be referred to a product or a method of intervention. The design method is instead a description of the process necessary to implement the theory in a given context. Finally the testable propositions are truth statements about the design theory.

Within this article we are focusing on the design product within the overall structure of a design theory. For this reason we found particularly useful the contribution of Baskerville and Pries-Heje [18] who distinguish between practice theories and explanatory design theories. In particular they state that explanatory design theories explain the reasons underpinning the satisfaction of a generalized set of requirements by a generalized set of object components. To depict the essence of an explanatory design theory, according to Baskerville and Pries-Heje [18], it is necessary to represent the general requirements, the general components, and the relationships between the twos. These two terms are deeply interweaved as also Baskerville and Pries-Heje mention: “the definitions of general requirements and general components must be circular. Requirements specify (and explain) the reasons for components. Components are justified by requirements” [18].

In the light of the perspective of a design research effort, in this paper we seek to draft and discuss an explanatory design theory describing the features (components) that shall be included in a IT investments performance measurement and controlling system, highlighting the necessary conditions (requirements) under which such features holds valid.

3. IT Investments Performance Evaluation

The problem of investigating the value potentially delivered by investments in IT is deeply rooted in the field of IT business value research. IT business value research is a multidisciplinary research stream that examines the impact of IT investments on organizational performance [19] to evaluate profitability and effectiveness of IT investments [20]. This problem was, and still is, highly debated in literature. Several different approaches and theoretical perspectives were employed and used by researchers [19, 21].

The results of this stream of research are somehow controversial [22]. There are no clear evidences that a positive correlation between IT investments and organizational performance exist [23]. The contribution of IT investments on organizational performance is therefore many times elusive, not known, or taken for granted [5–7]. The IT value phenomenon was found to be highly context and conditions dependent

[19]. The topic still requires research efforts, also possibly rethinking the way the phenomenon was, so far, investigated [24].

The IT business value phenomenon is necessarily a cross-boundary problem, where technical, organizational, accounting, and managerial domain problems find a natural point of contact [14]. A useful state of the art of the research on IT business value is drawn by Kohli& Grover [24] which point out that:

- IT does create value;
- IT creates value under certain conditions;
- IT-based value manifests itself in many ways;
- IT-based value could be latent;
- IT and value are mediated by several factors.

The work of Melville et al. [19] instead contributed in identifying the loci inside which IT generates value. In particular they identified the focal firm (i.e. the firm running the investment) as the main locus inside which IT investments produce benefits. Inside the focal firm IT investments interact with other organizational resource and contribute to organizational performance improvements by means of business processes or activities improvements. The focal firm is embedded in a competitive environment where it interacts with competitors or partners. Specific design of inter-organizational relationships might constitute scenarios in which organizations benefit of IT investments when they make coordination and interaction of mutual efforts easier. Finally the macro environment groups the different competitive environments (i.e. sectors) in a given geographic area (i.e. a country or a region like the European Union). In the macro environment different policies or characteristics might promote or hamper the capability of focal firm to benefit from IT investments. In search of a potential relationship between IT investments and organizational performance many studies [9, 14, 25] investigated the phenomenon under the focal firm perspective, some of them focused more on the business process [25–28] or activity [29] level, seeking to grasp the foundation of the IT value phenomenon which, still remains latent.

Even though the boundaries of the IT value phenomenon seem to be thoroughly investigated, there is actually a lack of a performance measurement and controlling instrument to be used in organizational context to assess the value delivered by IT investments [30], and organizations are always in search of such tools to judge their IT investments decisions [12].

4. Discussion

Following the description of relevant kernel theories pertinent to the domain of the problem addressed by this paper given in the previous sections, this section will propose and discuss a preliminary design theory for an IT investments controlling instrument. The design theory will be articulated, following Baskerville and Pries-Heje [18] in a set of general requirements motivating, and justified by, a set of general components. A high level view of such descriptive design theory is provided in **Fig. 1**.

As regards the requirements, the kernel theory informs us that the IT Business Value is a multi faceted phenomenon on which technical, organizational, managerial,

and accounting, especially financial accounting [31], aspects find a mutual point of contact. A crucial aspect in the achievement of the IT business value was in fact found to be the possibility to establish a good shared understanding of the domain and of the problems that are into the play among these different subjects.

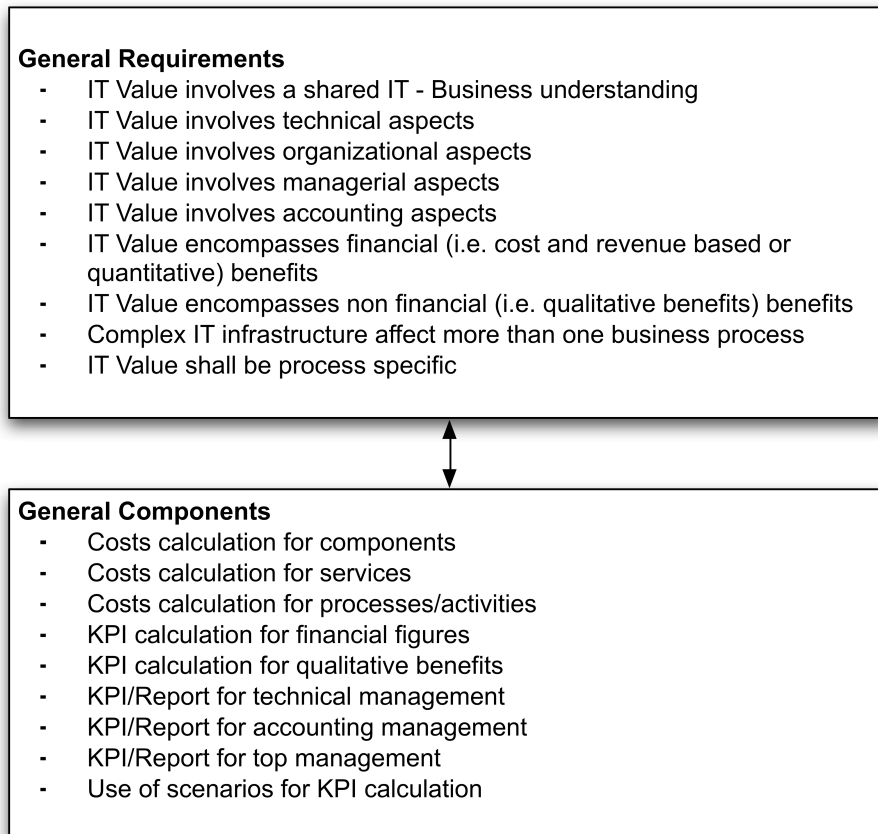


Fig. 1 - Explanatory design theory for IT investments controlling and performance measurement instrument

These aspects necessarily have to be matched by specific components of the sought performance measurement instrument. We therefore argue that such instrument shall then be capable of calculating performance indicators (KPI) both based on financial, technical, and qualitative figures so to be able to capture the different manifestations of the value delivered by IT. Such performance indexes calculation shall be complemented by the necessary reporting features, specifically tailored to the technical, accounting, or managerial role to which they are addressed. The idea is that such performance measurement instrument shall be capable of supporting both for the controlling activity at the middle management level, and for the corporate controlling

activity at the top management level providing inputs for performance measurement instruments like the balanced scorecards.

Moreover, since the theory informs that benefits estimation remains an uncertain, context, and condition dependent effort, such instrument shall allow users to build scenarios to calculate such benefits. Working with scenarios was already proven to be effective to this regard [12], allowing decision makers to take decisions regarding IT investments on the basis of a forecast complemented with a best (with better expectations) and a worse (with worse expectations) scenarios..

Finally another important aspect regarding the assessment of IT benefits is the unit of analysis. The theory suggests that the more granular the level of the analysis the more accurate will be the performance measurement. Since IT infrastructures can easily affect more than one process, such performance measurement instrument shall allow to calculate figures and ratios (i.e. qualitative and quantitative KPIs) both at a granular level (of components, services, or process and activities).

5. Conclusion

This research in progress paper illustrates a research project for the design and the evaluation of an IT investments controlling and performance measurement instrument to support organizational IT investments decision-making processes. To the current, limited, stage of development this paper only motivates the problem addressed, discusses relevant kernel theories for it, and proposes a preliminary descriptive design theory for such instrument.

In future research activities the investigation of the design theory will be deepened and reinforced, also recurring to specific empirical research. In particular we are planning to take a sample of enterprises operating in the Viterbo province, rich of economic activity and historically famous for its ceramic cluster. To ensure the necessary relevance of the research effort, and to provide a useful contribution, we will take into consideration medium and, if possible, large enterprises. The enterprises to be investigated shall all run IT investments to support or to execute their operational processes or their managerial activity.

Furthermore the recourse to an empirical setting will not only to strengthen the design theory, but also allow to identify a potential setting in which the designed theory for an IT investments controlling instrument might eventually be implemented and later evaluated on the basis of users feedback.

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