

Organizational Benefits of ICT: Investigating Factors Negatively Affecting the IT Value Generation Process

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Purpose of the Research

The literature has extensively debated the potential organizational benefits of ICT resources. This debate, made of different and intertwined trajectories, eventually acknowledged that ICT resources generate organizational benefits (Grover & Kohli, 2012; Kohli & Devaraj, 2003), but posits that such benefits manifest in different ways, and are subject to context conditions that may make the benefits latent or evanescent (Nevo & Wade, 2010). The debate on the organizational benefits of ICT is multidisciplinary, and goes under the name of *IT value* (Melville, Kraemer, & Gurbaxani, 2004; Oh & Pinsonneault, 2007). Much part of it focuses on how to assess the value produced by ICT. Few studies deepened the role of the contextual factors that mediate the actual realization of the prospected benefits of ICT adoption (Nevo & Wade, 2010).

Under a theoretical perspective, value creation takes place at all levels inside organizations (Jones, 2007). Technology and innovation processes are determinant of the organizational value creation (Pitelis, 2009). They play anyhow only a potential role as actual value is realized when technology and innovation interact with organizational structures, strategy, values, competition, and agents' conjectures (Pitelis, 2009). To ensure an actual contribution of ICT resources to the value generation in the organization, the technology shall be managed with governance frameworks suited for the nature of the activities performed and industry in which the organization works (Campbell, McDonald, & Sethibe, 2009; Kohli & Devaraj, 2004).

The interaction between the ICT resources and the characteristics of the organization using them is fundamental for an actual value generation, and such aspect has been neglected by the literature for a longtime (Ragowsky, Stern, & Adams, 2000). ICT and other organizational resources are synergic, and are capable of producing sustainable competitive advantage when properly combined (Aral & Weill, 2007). The knowledge of factors explaining how ICT resources interact in the value generation process is anyhow still limited (Aral & Weill, 2007; Nevo & Wade, 2010).

On the complementarity between ICT and organizational resources, the theory clarified the existence of an IT value generation process in which the interaction between the two kinds of resources produces an impact in terms of improved performance of business processes, which eventually turns into improved organizational processes (Melville et al., 2004, p. 293). Nowadays IT infrastructures and organizations complicate the IT value generation process: knowing which IT resource affects which business process and how is a complex undertaking (Braccini, 2011; vom Brocke, Braccini, Sonnenberg, & Spagnoletti, 2014). ICT resources and business processes are highly interrelated. Events affecting the IT infrastructure produce a ripple effect on several business process, and the other way round (Scheepers & Scheepers, 2008). Consequently, the theory currently treats the IT value generation process as a black box. Few is known on the influence – both positive or negative – of factors affecting the IT value process, and on how ICT resources and organizational resources interact to produce, or consume, value.

This work aims at contributing to this aspect by focusing on the contextual factors of the IT value generation process. The work studies how specific organizational characteristics hamper the actual possibility to obtain benefits from IT investments, through the production of slacks. The study is motivated by the following research question: *which organizational factors impact the IT value generation process and how?*

Research Methods and Design

The work is based on the results of three action research projects run on three individual and independent case units. In action research researchers cooperate with domain experts in the solution of practical problems, extending at the same time their scientific theoretical knowledge (Baskerville & Myers, 2004). It is a practical oriented research methodology that suits the study of organizational phenomena in real world contexts (Avison, Baskerville, & Myers, 2001).

All the three case units use IT resources to support their operations. In all the three cases the management of IT resources is a responsibility of internal organization unit(s). In all the three cases the units failed to achieve expected benefits of IT investments. The analysis of the three units was performed through primary and secondary data (see Table 1 for the details).

Through the action research process the author worked in the field with domain experts in identifying the problem, assessing the causes, and proposing a solution. The knowledge gained through the accompaniment of the three case units in the identification of the problems solution helped to identify organizational factors that prevented these units to achieve value out of their ICT assets, and a process through which IT management capability is worsened and IT slack resources are produced.

	Case 1	Case 2	Case 3
Primary data	Interviews with key staff members: CEO, CIO, ICT team leaders, three ICT team members	Interviews with key staff members: CEO, CIO, 2 IT managers	Interview with key staff members: CIO, CFO, IT controlling manager, IT portfolio manager, 2 IT infrastructure managers, IT staff members
Secondary data	Observations of software artefacts	Financial data IT assets catalogue Organizational assessment report	Financial data IT assets and service catalogue Assessment report

Table 1. Data sources for the three case units

Case Contexts

Unit Case 1

The unit case 1 is a high education institution with about 600 employees, which uses ICT to dematerialize and control administrative processes, and to disseminate information on internet and intranet platforms. The IT management is assigned to two units:

- The IT department: seven staff members plus the CIO;
- The business intelligence unit: two staff members plus the team leader (BITL), under the control of the CFO.

At the time of the analysis the units were under different reporting lines, and under the eventual control of the CEO. The organization planned an IT infrastructure integration and rationalization expecting: improved administrative processes lead time, improved timeliness of information dissemination, costs savings (less contracts for external suppliers), simplification of the IT infrastructure (decommissioning of assets).

To achieve these aims the CEO asked the CIO and the BITL to create a task force to design and deliver a solution. The task force worked at the problem analysis but eventually entered in internal competition. The two groups in the task force (IT department and BITL unit) worked separately eventually implementing two competing prototypal solutions, failing to provide the expected solution. The integration project and the decommissioning were delayed by two and half years. The contract for external supplier was renewed for a further year. Eight man months of work were wasted by the task force.

Unit case 2

The unit case 2 is a public transportation company with about 4,000 employees, which uses ICT to run the organizational information systems, to plan and control the service, and to disseminate information through internet and intranet portals. The IT management is assigned to two units:

- The IT department: 12 staff members plus the CIO;
- The operational planning department: four staff members plus the manager.

At the time of the analysis the two units were under different reporting lines, and under the eventual control of the CEO. The unit case 2 had difficulties in IT investments planning and operations due to highly bureaucratic processes to approve assets purchase. Consequently, it had switched to virtual technologies for the IT Infrastructure expecting benefits such as: reduced costs (energy, facilities, and hardware maintenance), reduced administrative burdens, increased rationalization and flexibility of IT asset management.

One staff member in the IT department oversaw asset management, and he used to deploy virtual IT assets to internal customers upon request as single responsible for these decisions. Two years and half the capacity of the IT infrastructure was already close to saturation, although internal demand for IT services did not change.

An internal review found assets duplicated, unused, or without a clear ownership (respectively 2%, 7% and 23% of 168 servers). The usage of infrastructural services by these assets increased the annual costs by 8% (estimated). A total amount of 4,5 man months were necessary to review all the internal IT assets to provide these figures. The internal organizational assessment included extra costs for about 45 k Euros.

Unit case 3

The unit case 3 is a large international industrial company in the construction industry, with about 13,000 employees, and using IT services to manage the information systems, and several internet and intranet services. The unit has 200 employees in the IT department divided across three different geographical locations (America, Europe, Asia). The IT department at the company headquarters (Europe) was the largest both in terms of staff and assets managed (110 staff members, about 550 hardware and 200 software assets). The department is under the control of the CIO who reported to the CFO. IT asset management is assigned to four sub-units in the IT department:

1. Networking;
2. Storage and backup;
3. Unix technologies;
4. Windows technologies.

The IT department had several difficulties in managing IT infrastructure costs planning as estimation of costs were frequently breached. This was so since the sub-units: (i) did not have a full view of the IT assets, (ii) did not have the full control of the lifecycle status of the IT assets, (iii) had difficulties in coordinating physical resources usage considering the physical asset management in the data center was under the control of a different unit in the IT department. These circumstances negatively affected the capability of the IT department to calculate and cross-charge costs for IT services to other organizational units. As a matter of example, the CIO reported he had asked the IT department to estimate the annual costs for the operations of the ERP service. The question was asked 5 months before the analysis, and had remained unanswered till then.

The IT department run an internal innovation process to align the IT asset information and management processes across the four sub-units and with the finance department, design a new process for demand, planning and decommission of the IT assets assisted by a piece of software. With the results in place the unit discovered that they had paid suppliers a price 45% higher than their internal costs for outsourced IT services.

Preliminary Findings

Table 2 summarizes the cases analysis by showing the main elements in each of the settings in terms of the type of innovative action that was put in place, the expected versus the actual benefits, the contextual factors, and the diagnoses which were identified as causes of the situations observed.

	Unit 1	Unit 2	Unit3
Action	IT platforms integration IT infrastructure simplification	Switch to virtual IT infrastructure	Specialization of IT asset management
Expected benefits	Reduced administrative efforts Improved timeliness of information dissemination Costs reduction IT infrastructure simplification	Reduced administrative efforts Increased effectiveness and flexibility of IT asset management	Effective IT asset management
Achieved results	Duplication of resources Internal competition Extra costs Extra time	Duplication of resources Extra costs Lack of control of IT assets	Excess of costs payed to suppliers Lack of control of IT assets planning
Contextual characteristics	Horizontal differentiation Two units under two different managers (CIO & CFO)	Horizontal differentiation Two units under two different managers (CIO & CEO)	Horizontal differentiation Four units under the same manager (CIO)
Diagnosis	Lack of horizontal communication Lack of integration Privatization of shared IT resources	Lack of horizontal communication Lack of integration Poor demand management Privatization of shared IT resources	Lack of integration Lack of coordination Misalignment and mismanagement of asset data

Table 2. Summary of the three cases

In all the three cases the absence of formal integration mechanisms across the units responsible for IT asset management is associated with the creation of IT slack resources. In theory reusable, these resources are usually wasted because: they are made private, and not connected to an existing business process. Though not in production, these resources increase the complexity of the IT infrastructure and of its management in terms of the number of assets available and of the interdependences among them. The management of the IT assets is complicated consequently. The interdependence among the IT resources amplifies the number of slacks created. For instance, the need for a server for a web based application requires a database server, storage space, backup, disaster recovery, and network bandwidth, contributing to the increase of costs and with a net effect that is higher than that of the individual new server. The multiplier effect of the slack resources creation in turn complicates the management of IT resources.

Theoretical, Empirical, and Managerial Implications and Contribution

Answering the RQ, the contextual factors affecting the IT asset management processes identified are: (i) the decentralized decision making, (ii) the horizontal differentiation, (iii) the lack of formal communication, and (iv) the lack of formal integration. The decentralized decision making is that related to the decisions of the asset management. The decentralization takes place by the delegation of the decision on how to manage assets to sub-units. The IT management is horizontally diversified because of a specialization need. In the presence of a lack of formal integration and communication mechanisms, these factors increase the complexity of the IT asset management processes.

Under these conditions some IT assets are privatized, and are introduced in the IT infrastructure following a local demand management (i.e. for the need of a specific sub-unit). These assets are seldom associated to a business process and are potentially unexploited resources which, if they remain in the IT infrastructure, produce two vicious effects. On the one side, they have a negative

effect on the IT value generation consuming other IT resources, multiplied by the complexity of the IT infrastructure. On the other they complicate the IT asset management process.

Figure 1 visually represents the theorized mechanism which has been discussed with the management (both IT and non) of the organizations involved, and with IT management experts.

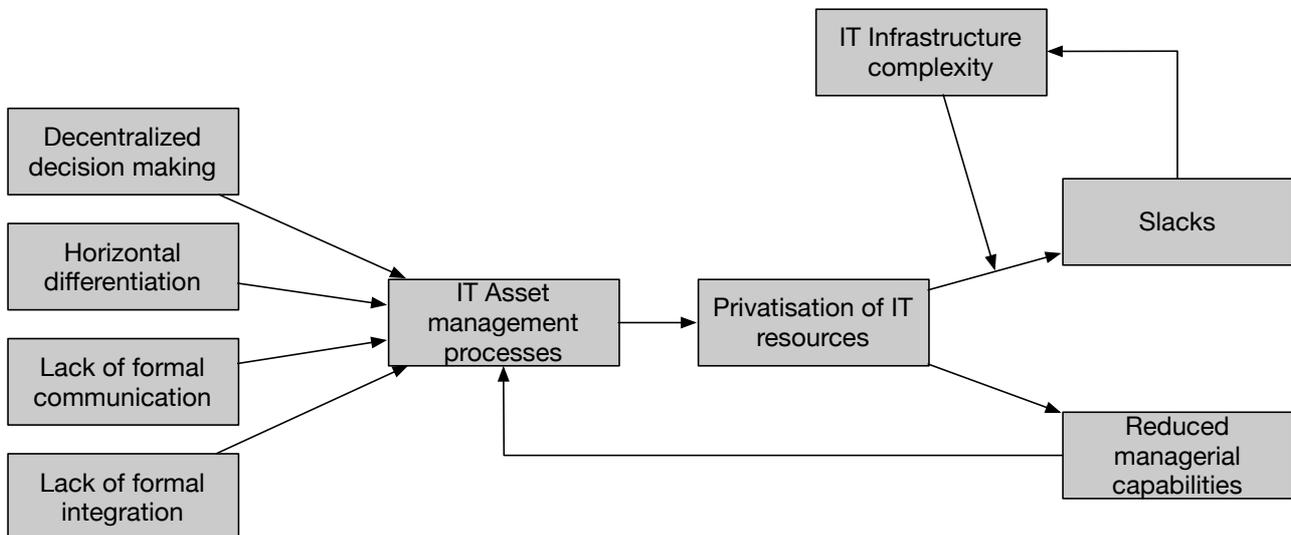


Figure 1. Production of slacks in the IT asset management process

The results of this work suggest implications for research and practice. From the research side the work sheds light on the impact of organizational factors on the IT value generation process identifying four factors that enact a vicious process that hampers value generation. One immediate research implication would be that to confirm the effectiveness of the four contextual factors in different cases of missed IT value or of resources squandering.

Unit 1 and 2 belong to the public sector, while Unit 3 to the private sector. While observations are consistent through the units, due to the differences in terms the value creation logic (i.e. public vs private value), IT asset management may follow different procedures. Hence a research implication would be that of investigating to what extent IT slack resources are detrimental for IT value generation in the public and in the private sector. Finally, in one of the three units, the presence of virtual IT infrastructure seems to reduce the perceived importance of the IT investments. While this has not been deeply investigated in the current research, such aspect shall be further studied as it might undermine public and virtual cloud strategies for IT infrastructure management.

Concerning the managerial implications, adequate integration and coordination in the IT asset management processes, especially in the demand management process is a priority. Even in the cases where IT management is specialized in more than one organizational units formal integration and an adequate level of communication are necessary to avoid the creation of slack resources.

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