Volume 17 Issue 13
Originally issued as A5

Global Journal of Management and Business Research: a Administration and Management
Volume 17 Issue 5 Version 1.0 Year 2017
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4588 & Print ISSN: 0975-5853

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The question is why, under such conditions, many Organisations fail to realize the positive impacts expected from IT investment, which by itself is then rather scarce and difficult to attain. To answer this question we concentrate in this paper on the issues of IT business value measurement and more specifically we attempt to answer the research question of how best to define the "business value" of IT and what factors may affect it.

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GJMBR-A Classification: JEL Code: M10



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The paper first puts forward the main definitions used for both "IT" and "Business value" in the literature. It then goes on to present and critically examine the most prominent of the existing methodologies for measuring "IT Business value" again by resorting to a relevant literature search. Then, we examine the special influencing factors that are at work in times of economic austerity and uncertainty and puts forward a framework for analyzing IT Business value under conditions of economic austerity. This framework is presented in terms of its elements and a description of their main characteristics and measures (metrics). Finally, before the conclusions, a list of the critical success factors for IT investment is presented which is based on a previous published work of the author.

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I. Introduction

The business value resulting from investments in IT[1] has been and still is one of the major research topics for researchers in the field of IT and IS[2]. Most of the early studies in the specific research area have failed to find strong evidence in order to support a positive correlation between investments in IT and increased business value, suggesting that investments made in IT provide little, or no, value to the investing organization. Most recent studies though, seem to provide a more solid evidence and arguments that investments made in IT actually do provide organizations with both operational and strategic "value" but the causal relationship between IS investments and business value remains partly unexplained(Baker, Song, & Jones, 2008).

The research area of "IT business value" is complex and it involves a great deal of uncertainty that stems from the fact that the core constructs of "IT" and "business value" are conceptualized and interpreted differently each time, depending on the specific research context. This situation can be partially explained by considering the plethora of academic disciplines (each with each own theories and research methodologies) that have been engaged in this area throughout the years. Examples of such disciplines are mainly the ones for Information Systems, the disciplines of Economics, Strategic planning and management, Accounting and Operations Research.

This paper attempts to answer the research question of how best to define the "business value" of IT and what factors may affect it especially under conditions of economic austerity and uncertainty. Many authors have tackled the research question of defining and measuring IT business value, but to this author's knowledge almost never this issue has been considered for the case in which the implementing Organisation operates under conditions of wider economic austerity and uncertainty. Our main aim in writing this paper is therefore to clarify the concept of IT business value under conditions of economic austerity and recession and by doing so to provide the elements of a methodology, which could be used to measure and identify these impacts in the future.

The paper first puts forward the main definitions used for both "IT" and "business value" in the literature. It then goes on to present and examine the most prominent of the existing methodologies for measuring IT Business value, by resorting to a relevant literature search, as well as to our own findings. Then, the paper examines the special influencing factors that are at work in times of economic austerity and uncertainty and puts forward a framework for analyzing IT Business value under such conditions. This framework is presented in terms of its elements with a description of their main characteristics and measures (metrics). Finally, before the conclusions, a list of success factors for IT investment is presented.

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[1] Information Technology
[2] Information Systems

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a) Defining "IT" and "Business Value"

The *Information Technology* (IT) as a concept can be defined in several ways. According to (Orlikowski & Iacono, 2001), the IT "artifact" can be defined in terms of five different conceptualizations as summarized below:

i. The "*tool view*". This sees IT as an *engineered tool* that does what its designers have intended for it, for example enhancing productivity. In this definition, the technology used and the largely technical matters that define IT (separate, definable, unchanging, and over which humans have control) are the parameters that define IT. This view first was introduced in (Kling, R., 1987) and (Latour, B., 1987). The "tool" view was represented in the IS research literature in four different ways: as a *tool for labor substitution*, a *tool for enhancing productivity*, a *tool for information processing*, and a *tool for changing social relations*.

ii. The "*proxy view*". This is based on the assumption that the critical aspects of IT can be captured through some set of (usually quantitative) measures. These measures can be classified as referring to:

- ✓ *Individual perceptions* i.e. IT as viewed by individual users. In (Moore, G. C., Benbasat, I., 1991)an instrument is developed for assessing individual users' perceptions of the so-called "new technologies", mainly IT.
- ✓ *Diffusion rates* i.e. measures of diffusion and penetration of a particular type of IT such as electronic mail, within some socio-institutional context such as a firm, industry, or society.
- ✓ *Dollars spent*to cover the costs associated with the IT tools themselves (e.g. dollars spent on hardware and/or software, or on the information systems infrastructure (e.g. dollars for the IT department budget).

iii. The "*ensemble view*" which was developed to meet and satisfy criticism of the previous two views and the need that IT technology should be looked upon as one element in a "package," which also includes the components required to apply that technical artifact to some socio-economic activity (Kling and Dutton, 1982), (Illich, 1973), (Kling and Scacchi, 1982). In this view, also known as the "web of computing", additional resources such as training, skilled staff, support services, and the development of organizational arrangements, policies, and incentives to enable the effective management and use of new technologies, are included.

iv. The "*computational view*". This view concentrates on the computational power of Information Technology being interested primarily in the capabilities of the technology to represent, manipulate, store, retrieve, and transmit information, thereby supporting, processing, modeling, or simulating aspects of the world (Orlikowski & Iacono, 2001). There are two types of the "computational view" found in the literature: The first involves the actual development of algorithms and the production of running code as applied to particular domains. The second involves the development and use of computational capabilities to create models that represent or simulate specific social, economic, or informational phenomena of interest (e.g., decision-making).

v. Finally, the "*nominal view*". This refers to IT being invoked by name only, but not in fact. Typically, in this view, the terms "information technology", "information system", or "computer", are used in the literature with no reference to the technology per se. They are used either incidentally or as background information (for more see Beath and Orlikowski, 1994).

More recently, researchers have begun to incorporate and analyze the role of organizational structure and innovations in the process of IT definition and "business value" creation (Brynjolfsson & Hitt, 2000).

Coming now to the notion of "*business value*", this has also been interpreted and conceptualized differently depending on the context in which it is analyzed. Researchers have used notions such as "economic value", "economic benefits" and "economic impact" due to IT, when attempting to define and conceptualize what "business value" is, but there are also non-financial notions that should be considered and used in order to define and understand "business value". Such measures include the "organizational capabilities", "organizational performance", "strategic position" that a firm can adopt due to the business value gained by the IT investment and others.

The concept of "IT business value" refers to the "value" that is attained by the investment in IT for the investing Organisation or business and its definition and measurement has given rise to a number of methodologies proposed in the literature, the most prominent of which are presented in the following section.

II. Methodologies for Measuring "IT Business Value"

a) Levels of examination

Before focusing on the main methodologies for IT business value we should mention that there are usually three levels of consideration that play a significant role in the conceptualization of this value. These are:

a) The *level of examination* i.e. whether we refer to the individual unit level, or the firm level, or the whole industry or the (national) economy as a whole. In each level, different variables can be taken into account as "measures" of business value. For

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example, at the firm level the "*IT business value "*has been defined as the impact of IT investment on firm performance (Mukhopadhyay, Kekre, & Kalathur, 1995). Others have used the impact on *productivity* of the investing organization (E Brynjolfsson & Hitt, 1996) or the creation of different *profitability ratios* such as the *Return on Sales* (Bharadwaj, 2000), and so on.

b) The *object of evaluation.* This level refers to what is specifically being evaluated in a specific context i.e. what will be the element that generates business value. Many researchers have focused their research on evaluating operational level variables such as *capacity utilization* of specific strategic business units or broader higher level variables such as *market share* (Barua, Kriebel, & Mukhopadhyay, 1991).

c) The *time of the evaluation.* This level also plays an important part in the type of impacts that will be measured. For example, a pre-implementation evaluation will provide information on potential impacts and attributes that can be defined before IT implementation and will aim to provide support to decision makers in order to help them decide which of the different options they should act on. A post-implementation evaluation will provide information about the actual business and the actual impacts that were created by the investment.

Taking into account the above, we refer below to a number of the most prominent specific methodologies that have been proposed in the literature for the definition of "IT business value".

b) The Microeconomics method and paradigm

From the microeconomics research, the theory of production has been employed in understanding and measuring the IT business value. By understanding the production processes that take place within an organization, as well as the economic processes of converting inputs into outputs, the method conceptualized the processes involved and provided estimates of the overall economic impact that investments in IT have on the organization and its "business value". In using the theory of production to define and measure IT business value, Erik Brynjolfs son described what he called "the productivity paradox of Information Technology" (Erik Brynjolfsson, 1993) i.e. the negative or non-existent relationship between IS spending and an organization's productivity. He also identified and analyzed four explanations for this "IT productivity paradox":

a) Data miss-measurement,
b) Existence of time lags (i.e. that IT productivity benefits, only show up after an investment has matured within the organization),
c) Redistribution effects, and
d) Mismanagement issues i.e. due to mistakes and ineffective management.

A later study by the same author assessed the contributions that IS had on firm-level productivity by applying the theory of production on firm-level data(E Brynjolfsson & Hitt, 1996). It concluded, that IS spending had made a "substantial and statistically significant" contribution to firm output, accrediting their positive findings on the fact that their data set at the time of the study was larger and more recent.

Other publications have also used the microeconomics paradigm and produced relevant methodologies and definitions for assessing "IT business value", e.g. (Dewan, et al, 1998), (Brynjolfsson, 1996), (Brynjolfsson & Hitt, 2003).

c) The Industrial Organization Theory method

The industrial organization theory has offered some valuable insights to business value research. By building on two existing organization theories, the "agency" theory and the "transaction cost "theory, Gurbaxani and Wang created an elaborate framework in order to examine the impact of IT on two main attributes of firms, namely *firm size* and *allocation of decision rights* (Gurbaxani & Whang, 1991). These two factors were chosen because the study was mostly based on the notion that firm size and the allocation of decision-making authority among the various firm actors are determined by the costs that are associated with acquiring, storing, processing and disseminating information. Although the theoretical framework was not further analyzed by the authors by using for example firm or industry level data, this research revealed that the allocation of decision rights depended heavily on organizational and environmental factors such as culture and the role if IS within a specific firm context. Finally, further research by the authors also indicated that a firm would be more likely to grow horizontally and vertically if IT was used for the reduction of internal coordination costs.

In a more recent work on oligopolistic competition, game theory was employed in order to give explanations for the overinvestment in IT that had been documented over the past years and the productivity slowdown, referred to earlier as the "productivity paradox "(Belleflamme, 2001). The results of this research confirmed the notion that, if firms can use IT not only for cost reduction but also for product differentiation, it is more likely that a fall in total factor productivity would occur when the latter usage is preferred to the former.

d) Organizational Behavior Theory

The organizational behavior theory has been used in order to investigate the impacts that IT has on firm performance and the combined effect of technology

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and BPR[3] on the performance of the investing organization. A prominent example of this approach was the application of the organizational behavior theory in the context of the health-care industry (Devaraj & Kohli, 2000). The issue investigated there, was the link between technology and process reengineering with profitability and quality, as well as the combinational effect that technology and process reengineering have on organizational performance. Using both cross-sectional and time-series data between several hospitals over a 3-year period, the authors showed that IT investments contribute significantly to both increased profitability and quality. Most notably, similarly to the "time-lags" theory of Brynjolfsson mentioned earlier, this study also found that the benefits resulting from BPR initiatives do not manifest immediately and that it was the combination of investments in IT and BPR initiatives that was shown to have significant effects on the profitability of the hospitals examined.

A more recent work, (Silvius, 2006), proposed that in order to thoroughly assess the business value created by IT investments one must first have a detailed understanding of the organisational impact that IT has and the relationship between IT impact and organisational performance. His method consisted in building so called *IT investment-balanced scoreboard*, which contained four elements:

1. Financial, i.e. traditional financial valuation methods such as Return on Investment etc.,
2. Customer related, i.e. the impact on the marketing of the organisation,
3. Innovation & Growth, i.e. a perspective on the future options and possible competitive effects of the investment, and
4. Internal, i.e. the impact of the investment on internal business processes of the organisation.

e) The "Variance" approach

The *variance approach theory*[4] focuses on portraying relationships with variations in the values of their descriptive variables but with the assumption that the relationships between the entities and their properties will remain constant. One of the benefits of this approach is that entities can be re-calculated according to the area that is being studied, providing flexibility at the hands of the researcher. This approach allows for a widespread variety of statistical mechanisms that are available and can be used to test the theories that are created without making it necessary to use fixed (deterministic) variable values.

The variance approach assumes that there are always the necessary and sufficient conditions at play, as well as measurable dependent and independent variables, in order to describe concepts and their properties which are called "factors". Although the properties of these entities can assume different values, the definition of the entity that is used as a description of the property, will always remain the same.

f) Resource based approaches

These approaches utilize the resource-based view of the firm in order to examine (mainly through empirical observation) the relation between IT capabilities (IT viewed as an organizational capability) and business performance. The resource-based view of the firm is helpful since it can be used to provide links between the performance of an Organization and the specific resources and skills that are unique to that Organization, rare and difficult to imitate.

A representative study of this approach is a study reported in 2000 entitled "A resource-based perspective on information technology capability and firm performance: an empirical investigation" (Bharadwaj, 2000).The results of that study showed that the IT capability when combined with other complementary investments creates a unique pool of resources that cannot be easily matched by rival organizations. Although some of the firms examined were able to create a strong IT capability, not all of them gained in terms of profitability from it. According to the study, this result shows that although many may be in a position to acquire strong IT capabilities, only few are in a position to create an organization-wide IT capability with the right resources in place in order to achieve positive end long-standing results.

g) Process Theories

The approaches based on the "process theory" attempt to provide explanations even when causal agents are not sufficient for the outcome to occur (outcome uncertainty). All relevant approaches examined, contained a cause-effect argument of the "necessary, but not sufficient" form, which is mainly a common characteristic of process theories. Soh and Mark us attempted to synthesize already existing processes and variance theories in order to resolve apparent contradictions between them in addressing the issue of how IT creates business value (Soh & Markus, 1995). In doing so, they have created one single process theory model that consists of three process sub models (*IT expenditure to IT assets*, *IT assets to IT impacts, and IT impacts to Organizational performance*).

Another notable work was that of Mooney, Gurbaxani, and Kraemer who followed an approach to measuring business value based on the impacts on business processes (Mooney, Gurbaxani, & Kraemer, 1995). A number of "metrics" categorized by the type of business process (operational or managerial) and the so-called "dimensions" of IT business value (defined as auto mational, informational, and transformational) measured these impacts.

[3] Business Process Reengineering
[4] For details, see (Burton-Jones, McLean, Monod, 2015).

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III. Defining IT Business Value in Times of Economic Austerity

Economic austerity measures are taken as the response of a government whose ability to borrow money is curtailed or diminished due to several reasons the main one being large public debt and inability to service the required payments on this debt and therefore there is a "default risk". Raising taxes and reduced expenditures on public projects and programs are the main tools that a government in financial distress use to reel in their deficits. At the same time, falling private income reduces the amount of tax revenue that a government generates. In such environment, businesses are squeezed between falling demand for their products or services, reduced public expenditure, and increased taxation. Many European countries such as Greece, Italy, Spain and Ireland, (but also more recently Finland too) were forced into a mode of austerity of higher or lesser degree in order to stabilize their economies following the massive credit crisis and global recession of 2008, which left their balance sheets crippled.

The regimes of economic austerity that were implemented in Europe since 2009 have run contradictory to the schools of economic thought that have been prominent since the Great Depression and which were influenced by the so called Keynesian economics[5] which stipulated that the governments should increase spending during a recession in order to replace falling private demand. The logic was that if demand is not propped up and stabilized by the government, unemployment will continue to rise and the economic recession will be prolonged. Under the regime of strict economic austerity, currently followed in Europe, the opposite trend is followed especially for the countries mentioned earlier which belong to the European Union.

Countries that belong to a monetary union, such as the European Union, do not have as much autonomy or flexibility to use their central banks to artificially lower interest rates or increase the money supply in an attempt to encourage the private market into spending or investing its way out. In this case, the only feasible option for these countries is to reduce spending and raise taxes thus enacting the business squeezing cycle mentioned above. By contrast, autonomous countries can use a number of other options mainly lowering interest rates and increasing the money supply to get out of a downturn[6].

Under such conditions of economic austerity, the definition of the "business value of IT "would require a more holistic and multidimensional approach in order to be able to take into account the influence of the complex "environment" (economic, business, social) under which the organisation operates. It therefore will not always be possible to use existing methodologies for measuring "conventional" business value and IT investments under such conditions may be likely to cause a variety of impacts that will comprise potential benefits as well as dis benefits[7].

Thus, under conditions of economic austerity it is important to understand and take into account – in defining the business value of IT investment – all possible impacts in a multidimensional sense including the non-economic ones. This can be done more efficiently by use of a *process*-based methodology. The tools provided by the *process theory* enable the involvement and analysis of a wide variety of different variables that affect and take part in the creation of business value but also it could be combined with elements from other methodologies within an integrated framework of "IT business value definition under an economically austere and turbulent environment".

Such framework is examined in more detail in the following.

IV. A Framework for Analyzing IT Business Value Under Conditions of Economic Austerity

a) *The interacting factors*

Figures 1 and 2, below, show a possible framework for defining IT business value in times of economic austerity. The novel feature of Figure 1, is the entry and interaction of the so called "environment" factors (meaning all relevant elements of the environment under which an Organisation is operating) with the pure IT related elements. The result of this interaction is the overall (operational) performance of the Organisation as this is expressed by a number of variables and factors.

The main elements of this framework are described in more detail below.

b) *IT Resources*

As "*IT resources"* are meant a combination of *IT investment allocations (assets)*and a mutually reinforcing system of *competencies* and *practices* all interacting in order to produce the background IT infrastructure and competence of the organisation. An organisation,

[5] Named after John Maynard Keynes, the British thinker who fathered the school of Keynesian economics.

[6] This was the response of the US Federal Reserve, which has engaged in a dramatic program of quantitative easing since November 2009.

[7] It is reminded that even in times of normal economic conditions there are researchers who argued that organizations may have overestimated the strategic value of IT and thus overspend resources in adopting IT expecting an increase in the overall performance of their organisation (Melville, Kraemer, & Gurbaxani, 2004), (Oh & Pinsonneault, 2007).

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operating in an uncertain economic and business environment, is obliged to make its IT investment decisions and allocations by carefully evaluating the varying landscape of different business strategies of itself and its competitors, the available overall resources and IT *capabilities* that will ultimately result in performance. However, the ultimate and true *IT resources* that will result from investment decisions, are difficult to estimate and forecast because developing effective combinations of *IT assets* and *IT capabilities* takes time and concerted efforts spent learning and optimizing.

The above statement simply underlines the fact that possession of superior IT resources is not automatically linked to enhanced performance but it can generate competitive value only if IT is deployed in a way that it leverages pre-existing resources in the firm via "co-presence" or "complementarity"(Wade & Hulland, 2004).

The *IT resources* element of the framework is distinguished, in[8]:

- *Inside-out resources*, i.e. capabilities deployed from inside the firm, in response to market requirements and opportunities. These include:
  - *IT Infrastructure*, i.e. the standard IT (or IS) infrastructure resources such as off-the-shelf computer hardware and software which generally have not been found to be a source of sustained competitive advantages for a firm.
  - *IT Technical skills,* i.e. appropriate up-to-date technology skills that are held by Information Systems (IS) employees of the firm and relating to both system hardware and software. They include the ability to deploy, use and manage technical skills and knowledge that is advanced, complex and therefore difficult to imitate.
  - *IS Development*, i.e. capability to develop or experiment with new Information technologies and systems and alertness to take advantage of new technological developments. It includes capabilities associated with managing a systems development life cycle that is capable of supporting competitive advantage.
  - *IS operations*, i.e. ability to provide efficient and cost-effective IS operations on an on-going basis (e.g. avoiding cost overruns, unnecessary downtime and system failures etc.).
- *Outside-in resources.* These are resources originating outside of the organisation, with emphasis on: a) anticipating market requirements, b)creating durable customer relationships and understanding competition. They are relevant to:
  - *Market Responsiveness*, i.e. collection of information from external sources, as well as dissemination of a firm's market intelligence across departments and the firm's response to that learning (e.g. develop and manage project rapidly, react quickly to changes in market conditions, strategic flexibility: undertaking strategic change when necessary).
  - *External relationship management*, i.e. ability to manage linkages between the organisation and stakeholders outside the firm (it also refers to managing the outsourcing partners, customer relationships and so on).
- *"Spanning" of resources*, i.e. the interconnection and integration of both internal and external or "inside-out" and "outside-in", resources. They include:
  - *IS-business partnerships*, i.e. the process of integration and alignment between IS functions and other functional areas of the firm. Building internal relationships between the IS function and other departments such as business strategy, etc.
  - *IS planning and change management*, i.e. ability to plan, manage and use appropriate technology architectures and standards. This ability involves a) anticipation of future changes and growth, and ability to choose platforms that can accommodate this change, and b) effective management of the technology change and growth. This involves ability of IS managers to understand how technologies can and should be used, as well as how to motivate and manage IS personnel through a "change management" process.

c) IT Assets

The "IT Assets" element refers to IT investments allocated for particular strategic purposes. They have been distinguished in[9]:

- *Infrastructure*: i.e. all IT infrastructures including shared IT services.
- *Transactional assets*: i.e. infrastructures that relate to the facilitation of the firm's transactions with the outside world such as automated processes for cutting costs or increasing the volume of business per unit cost.
- *Informational assets*: i.e. all assets facilitating the provision of information for managing, accounting, reporting, planning, analyzing and data mining, and
- *Strategic assets*: i.e. those that support entry into a new market, provide a new service, or enable a new product.

d) IT Capabilities

This refers to IT capabilities that consist of a "mutually reinforcing system of competencies and practices that enable greater business value generation per IT dollar" (Aral & Weill, 2007). IT capabilities in this sense refer to an Organization's:

[8] As in (Wade & Hulland, 2004).

[9] See for example (Aral & Weill, 2007)

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a) *Human capital skills*, i.e. the technical or business skills of individuals or groups that work in the Organisation and actively manage or accomplish various tasks e.g. IT skills of employees at all levels or senior and middle management skills championing of IT initiatives in the various business units.

b) *Practices, i.e.* those referring to recurring sets of activities or routines that serve both as a means of accomplishing organizational tasks and as a mechanism for storing and accessing knowledge about the most effective ways to accomplish specific tasks.

c) *Intensity of IT use for communication*. This refers to the intensity of IT use for both internal as well as external electronic communication (e.g. e-mail, intranets, wireless devices, etc.).

d) *Degree of digitization.* This is the degree to which both internal and external transactions are performed electronically for key functions such as purchasing, sales, etc.

Internet capability, i.e. the degree to which firms employ internet architectures in sales force management, employee performance measurement, training and post-sales customer support, and so on.

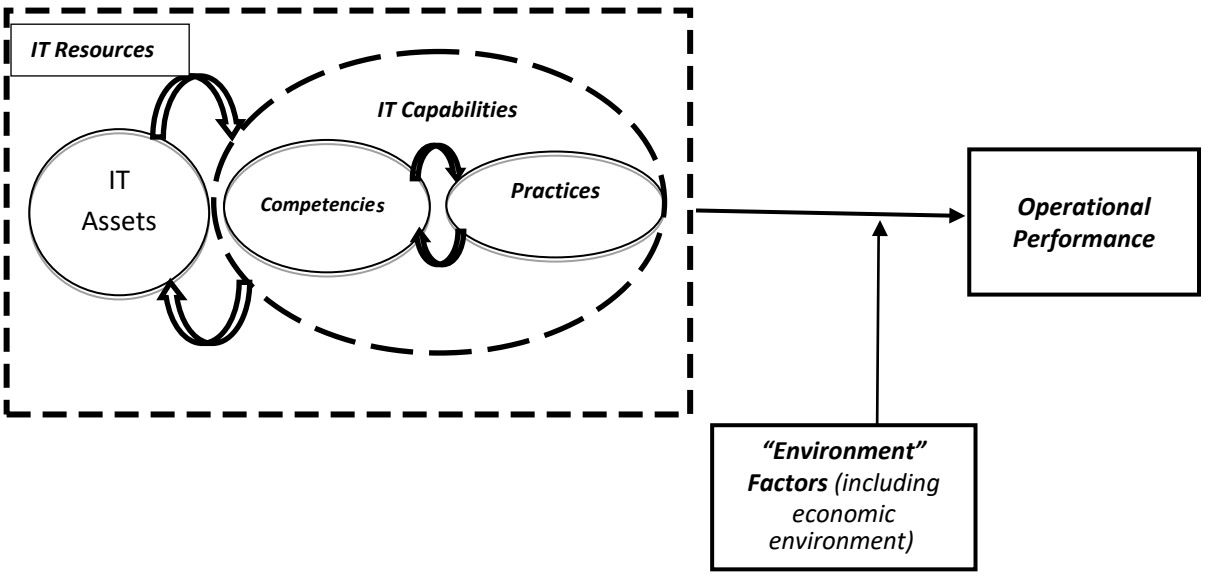

Figure 1: Schematic representation of the interactive way to define IT business value under economic austerity environments

Coming now to the "external" factors of the framework shown in Figure 1, we note:

e) Operational Performance

Many dependent variables can be used, to express operational performance outcomes. According to (Aral & Weill, 2007) suitable performance measures, are:

- *Profitability*: Net margin & return on assets (ROA).
- *Product innovation*: Revenues from new or modified products.
- *Market valuation*: This usually comes by comparing the market value of a company's equity and liabilities with its corresponding book values as the replacement values of a company's assets is hard to estimate. The most usual measure is the so-called *Tobin's q* ratio[10].
- *Cost efficiency*: This expresses performance outputs in relation to the cost of producing the goods sold.

Either, or a combination, of the above performance measures can be used in defining and measuring IT business value in times of economic austerity, but in general it may be difficult to relate one set of variables to another. By using as a basis for our analyses, the *Resource Based View* (RBV) approach, result scan be more focused. In addition, the "*Sustained*

[10] This is approximately equal to the ratio: *Equity market value* / *Equity book value* for single companies and *value of stock market* / *corporate net worth* for incorporated companies. If the market value reflected solely the recorded assets of a company, Tobin's q would be 1.0. If Tobin's q is greater than 1.0, then the market value is greater than the value of the company's recorded assets. This suggests that the market value reflects some unmeasured or unrecorded assets of the company. High Tobin's q values encourage companies to invest more in capital because they are "worth" more than the price they paid for them. If *Tobin's q* is less than one, the market value is less than the recorded value of the assets of the company and this suggests that the market may be undervaluing the company.

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Competitive Advantage" (SCA)concept, although difficult to operationalize, has proved to be a good representation of performance output but researchers employing the Resource Based View (RBV)approach have resorted to looking, instead, at related dependent constructs such as "above-average performance in the long run" and similar, in order to overcome these difficulties(Wade & Hulland, 2004).

Calculating the SCA (sustained competitive advantage) of an Organisation that is gained through IT investment and IT resources, in relation to enhanced organizational capabilities and efficiency is perhaps the most feasible measure of the performance of an Organization under a regime of (national) economic uncertainty.

f) "Environment" Factors

These refer to all factors reflecting the surrounding environment (legal, economic, social, political, and so on) within which an organisation operates. Under conditions of economic austerity the "uncertainty" that is reflected in this surrounding environment, becomes a fundamental factor of influence in almost all aspects of an Organization's operation including the way that IT investment produces "business value".

The dimensions of the "environment factors" under conditions of uncertainty that are likely to influence an organization's performance over time are[11]:

- *Environmental turbulence*: Unpredictable changes in the complexity of an organization's environment (not similar to a "dynamic" environment since the extent of change is unexpected). It is characterized by the:
  - Ability to stay on top of business trends and quickly respond to changing market needs (this is critical for superior performance).
  - Utilization of many and different types of resources in order to respond to the level of turbulence in the environment.
- *Environmental munificence*: The extent to which the prevailing business "environment" can support sustained growth. Relative to this notion it is noted, that:
  - Absence of munificence puts pressure on organizations to reduce investments in outside in and spanning of resources.
  - The competitive position of an organisation is affected by how environmental munificence affects the relationship between outside-in and spanning resources.
- *Environmental complexity*: This refers to the heterogeneity and range of an industry and/or an organization's activities. It refers to the:
  - Complexity of the surrounding environment that makes it difficult for firms to both identify and understand the key drivers of an organization's performance, and
  - Link between key resources and superior performance, which - under conditions of high environmental complexity - will tend to be stronger and more enduring.

[11] See also (Wade & Hulland, 2004).

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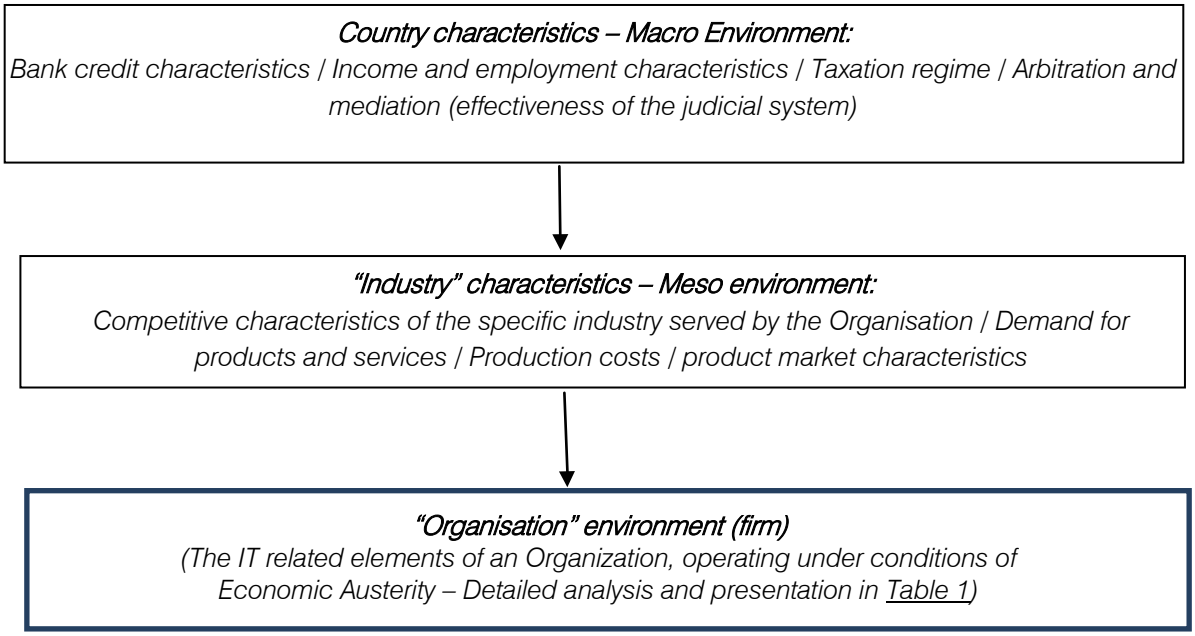

Figure 2: Definition and interrelation of the three levels that define the "environment" factors(A process theory approach)

Table 1: Analytic presentation of "environment" factors at the level of the Organization (*)

Focal point or process	Possible Metrics	Likely impact of EA	Impacts on output and performance
Management functions (With understanding of the organisational impacts that IT has, and of the relationship between IT and performance).	o *Admin expenses …* o *Use of IT tools …* o *Decision quality …* o *Speed of reaction...* o *Organizational skills…* o *BPR application…*	o *… Reduction* o *… Limited and well scrutinized* o *… Superior* o *… Limited due to complex "environment" interaction* o *… Improved* o *… more likel*	Necessary but not sufficient condition for increased organisational and overall performance. Clear and competitive position towards the competition and gaining advantages for the Organisation. By using a single process analysis model it can guide the relationship between IT resources and increased organisational performance
IT capabilities (Competencies – practices)	✓ *Human capital (no. of persons) …* ✓ *Intensity of IT use …* ✓ *Digitization degree* ✓ *Internet capability…*	✓ *…Reduced (quantity - quality)* ✓ *…Increased* ✓ *…Increased* ✓ *….Increased*	Necessary but not sufficient condition for achieving business value. Through use of a process theory model, need to study the transformation of raw materials (data and technology) into IT impacts. Through use of the variance theory, link the impacts of IT investment toother areas' performance to calculate overall IT business value.

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IT assets (Acquisition and deployment)		o *Technologies used…* o *Infrastructures for:* ▪ *Managing…* ▪ *Accounting…* ▪ *Reporting…* ▪ *Planning…* ▪ *Analyzing…* ▪ *Data mining…*	o *Relative to cost* ▪ *Reduced* ▪ *No impact* ▪ *No impact* ▪ *No impact* ▪ *Reduced*	IT assets (mainly technology, human resources and the relationship between IS and users) deliver business value due to the impact they create on critical business processes such as systems development, business operations, and planning. The relationship between the above and their impacts on different organisational processes will ultimately define the effectiveness (and benefits or d is benefits) of IT assets under conditions of Economic Austerity.
Operations	*Order processing*	✓ *Inventory size…* ✓ *Inventory costs…*	✓ *Minimized* ✓ *Reduced*	Under conditions of EA, operations will affect the final output and performance of an Organization through: ✓ *Reduced inventory size and thus reduced responsiveness to customers* ✓ *Inability to finance new products and innovation production, and* ✓ *Reduced reliability of operations*
	Efficiency of production processes	o *Labor costs…* o *Degree of utilization of resources…* o *Cycle times…* o *Responsiveness…* o *Reliability…*	o *Reduced* o *Unclear* o *Reduced* o *Reduced* o *Reduced*	
	Product innovation	✓ *Service innovation…* ✓ *Product innovation…*	✓ *Unclear* ✓ *Unclear*	
	Customer communication and interaction	o *Customer relations…* o *Use of web for CR* o *Promotion ability…*	o *Improved* o *Increased* o *Increased*	

(*)With reference to Figures 1 and 2

g) Necessary conditions of success

In conditions of operation under an environment of economic austerity, the conditions that may enhance the achievement of positive IT business value are worth mentioning here based on work which this author has done in the past (Giannopoulos A.G., 2015) as well on the work of other authors[12]. In summary, they can be presented as follows:

- *Top management commitment*: Successful IT investments require the commitment of top management in order to be driven forward. This is important, since managers will be responsible on later stages to identify and act on the benefits that the investment will provide, in order to increase the efficiency and effectiveness of the Organisation.
- *End User Involvement*: Besides the commitment from top managers and executives, it is also important to ensure that the end users of IT (within the Organisation or outside it) will be thoroughly involved and informed. The aim is for end users to be supported and motivated by the technology leading them to the discovery of new and innovative ways of performing their business by using it, something that will further increase the potential business value that the Organisation will gain through the IT investment.
- *Re-engineering and re-organising of processes*: In most cases, in order for an IT investment to be labelled as successful and for an Organisation to realize the business value it can provide, a great deal of re-organisation and re-engineering of normal business processes has to be undertaken within the Organisation. The aim of such re-organisation is so that information technology will a) "fit" tightly with

[12] See for example, (Soh & Markus, 1995), (Mooney, Gurbaxani, & Kraemer, 1995), (Davenport, 1998), (Chivukula, 2003), (Sward, 2006), (Peppard, Ward, & Daniel, 2007).

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the strategic purpose and other goals of the Organisation and b) enable the Organisation to understand the full potential of benefits and value of such technology.

- *Alignment (of the IT Investment) with strategic goals*: The business goals and expected outcomes from IT investment should be fully aligned with the strategies that an Organisation has devised for its future development especially when facing economic austerity and uncertainty. The technical and operational characteristics of the technology used should be carefully tuned to satisfy these goals.
- *Continuous monitoring and assessment*: Success will also depend on the degree to which the organisation will align its specific business goals with the achievement of specific measures of success and the establishment of a permanent system of assessment and monitoring of the business value achieved from a given IT investment. The measures of assessment of the business value will have to also take account of the competitive environment and the specific business context in which the Organisation operates.

V. Conclusions

Defining "IT business value" is a complex task that involves a great deal of uncertainty. However, since considerable investments are necessary for Information systems (IS) acquisition, installation and operation, and in the complex and full of restrictions environment of economic austerity that certain countries face for many years now, such definition and measurement becomes an important factor in decision making and successful operation.

The core constructs of "IT" and "business value" can be conceptualized and interpreted by using a number of possible methodologies which have been proposed in the literature by various researchers. These methodologies differ each time, depending on the specific business and "industry" context in which the Organisation under question operates. They were presented in summary form in this paper under the names of: "macroeconomics method and paradigm", "industrial organisation theory", "organizational behavior approach", the "Variance" method, "Resource based" approaches, and the "process theory" approach. The interested reader is referred to the rich bibliography given at the end of this paper for further details on these methodologies.

Under conditions of economic austerity, the definition of "business value of IT" requires a more holistic and multidimensional approach in order to be able to take into account the influence of the complex "environment" (economic, business, social) under which the organisation operates. It is therefore evident that it will not always be possible to use the above, "traditional", methodologies for measuring business value of IT investments under conditions of economic austerity. The paper, stipulated that under such conditions it is important to understand and take into account all possible impacts in a multidimensional sense including the non-economic ones. It then went on to propose (under a *process*-based methodology approach) a framework for analyzing IT business value under such conditions that is presented in Figures 1 and 2 and in Table 1 of the paper.

Under conditions of economic austerity the number of "external" factors that form the "environment" under which an organisation operates, take on an added importance and weight and have somehow to be clearly taken into consideration in defining the IT business value under these conditions. These factors – summarily called "environment factors" - refer to the surrounding legal, economic, social, and political space within which an organisation operates. The main complicating factor is that of "uncertainty" (meaning the sudden and unexpected changes in the rules and conditions under which an organisation operates). The three dimensions or levels of the "environment factors" are the following:

a) *Country characteristics – Macro Environment:* It includes the bank credit regimes that apply and availability of finance, the income and employment characteristics that apply, the taxation regimes, and the arbitration and mediation environment that operates i.e. the effectiveness of the judicial system. All these need to be taken into account as the "binding parameters" under which an organisation will create its IT business value.

b) *"Industry" characteristics – Meso environment:* These refer to the competitive characteristics of the specific industry to which the Organisation belongs, the level of demand for products and services, the production costs, the product characteristics and the characteristics of the market. Finally, the

c) *"Organisation" operating environment:* This includes all the internal influencing factors at the level of the firm. These include the management functions at all levels, the IT assets, the IT capabilities of the firm, and the various elements of operations (i.e. operating rules and conditions as presented in detail in Table 1).

Information technology has played a crucial role in assisting Organisations to identify and utilize new methods for conducting their business in a more efficient and effective way. This is primarily because IT provides an Organisation with tools and methodologies that allow it to do business more efficiently, access new resources previously unreachable and utilize them more effectively, and generally enable it to sustain these positive results. Unfortunately, many Organisations fail

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to realize such impacts from IT investment, due to a variety of different reasons. A key number of "success factors" have therefore been identified and proposed. These include, top management commitment, end-user involvement, re-engineering and re-organisation of the organization's processes, alignment with the organization's strategic goals and performing a continuous monitoring and assessment function that will provide the necessary data for corrective actions.

As regards future work in this area, it is foreseen that the elements of the proposed framework will be further defined, primarily in terms of the metrics that can be used for their definition and measurement. Also, the elements of the process theory approach should be employed in a more operational way in order to produce the full operational model of "IT business value definition under conditions of economic austerity".

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