

# Association of Business Value to Productivity through Information Technology

Tarun Kumar Singhal, Anubha Vashisht



**Abstract:** *The organizations around the world have integrated information technology into their processes with anticipation in the increase in productivity. Importantly, they have considered business value as a measure of productivity generated through the adoption of information technology. Carrying this forward, several information technology practitioners have tried to examine the relationships between business value and adoption of information technology. Business value aspects (employee value, customer value, economic value, and managerial value) have been examined in multiple research studies for adopting and implementing information technology. Some of the research studies have found a positive correlation between business value (as a measure of productivity) and the implementation of information technology.*

*This research paper has attempted to examine whether business value can be safely associated with productivity through information technology.*

**Keywords:** *Information Technology, Business Value, Productivity, Customer Value, Employee Value, Economic Value, Managerial Value.*

## I. INTRODUCTION

The challenge of connecting business value as a measure of productivity through information technology has been troubling Information Technology practitioners and researchers worldwide. This scenario has raised serious question marks on the business cases aiming to justify the investments being made in information technology. The general assumption behind creating business cases for investment in information technology is that information technology productively facilitates the processes while reducing/eliminating redundancies and wastages. However, a few research studies have notified that productivity has declined post implementation of information technology, and the expected benefits have not been realized [1].

On the other hand, research studies have also not been associated with business value as a measure of productivity through information technology. This lack of association of business value with productivity has caused severe damage to

the validity of the investments being made in information technology.

It has even suggested that information technology implementation can reduce the strategic advantage of the organization while diminishing its competitive advantage [2].

Also, another research suggests that the organizations fail to get the benefits of information technology implementation as the conventional standards of information technology are quickly adopted by the competitors for neutralizing the competitive differentiation [3].

### A. Information Technology and Productivity

Many organizations still treat information technology as a cost center with no clear expectations of its outcomes. This approach, sometimes, leads to under valuation of information technology in the organizational context.

Even before investments, the evidence of business value is asked, which complicates the scenario further. Information technology projects do not demonstrate immediate impact (as is in the case of enterprise resource planning, which takes months/years for the implementation itself). However, these information technology projects bring several micro, and macro changes in the way organizations are run and managed, leading to quantifiable outcomes. Also, several measures like time to market, customer satisfaction, increased market share, increased employee engagement, better supplier coordination, process acceleration, timely compliances, reduced wastages, etc. contribute to the overall deliverables of information technology projects.

Several researchers have tried to assess the impact of information technology on the productivity of the organization through aggregation and as well as through micro studies [4].

Several research studies have failed in acknowledging the long term contribution of information technology. Their primary focus was to find a correlation between information technology investments and the subsequent productivity generated while ignoring the long term organizational changes enabled by information technology [5].

A research study has specifically suggested that information technology investments do not cause observable differences in the performance of an organization for productivity, operating cost, sales, etc. However, they demonstrate a positive correlation with the last financial performances of the organizations. The results report a significant improvement in productivity when they are measured over a long period (5-7 years) [6].

Revised Manuscript Received on October 30, 2019.

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Another research has attributed the absence of productivity numbers to the errors of measurement models being adopted. Several benefits naturally associated with information technology (responsiveness, customer service, process agility, increased quality, etc.) are sometimes poorly reflected in productivity assessments and financial numbers of the organization underestimating the information technology productivity [7].

In the absence of a quantitative framework for evaluating information technology investments vis-à-vis tangible outcomes, the investments in information technology are squeezed. This reduction further leads to outdated information technology infrastructure, which distances itself from business alignment leaving the organization vulnerable to the market forces [20].

Organizations aim to extract competitive advantage through investments in their information technology infrastructure. The focus of the organizations is primarily narrowed down to tangible outcomes such as improvements in productivity and efficiency. In the absence of suitable tangible outcomes, which is sometimes the case with information technology, the entire business case of adoption and implementation of information technology is questioned.

This scenario, however, has undergone a few changes as the organizations have started looking for intangible outcomes and strategic values derived out of the investments in information technology [8]. Also, the alignment of information technology with business strategy is being advocated for better results from information technology [9] [10].

Though incorporating intangible values in assessing productivity through information technology is a welcome move, still assessing the intangible value remains a challenge as strategic gains (a measure of business value) are not easy to reflect in a monetary context. However, specific key performance indicators (sales cycle, customer satisfaction, inventory turns, cost/unit, etc.) can be included in assessing the intangible outcomes of information technology [11].

A research study defined intangible assets in terms of information capital, human capital, and organizational capital. These intangible assets contribute to value creation. This research further suggested the integration of intangible assets with the strategies of the organization to ensure the value creation. This research advocated the implementation of an integrated plan to ensure the enhancement of intangible assets of an organization [10].

The researchers working in the field of productivity through information technology have tried to develop a few methods, which can translate the intangible outcomes to tangible outcomes. Accommodating the causal relationship between organization and information technology, various intangible assets (human, organizational, informational, etc.) can be correlated with the bottom line of the organizations highlighting a possible approach to assess intangible value. Also, connecting various scorecards can help an organization visualize the value creation process, which can then be used in allocating more resources to the assets to help them generate maximum value [10].

Several research studies have concluded that implementation of information technology has positively

influenced the productivity citing examples of organizations which have benefited with gains in productivity. These organizations have been able to offer reliable products with customization features while increasing the efficiency of operations.

### B. Business Value Dimensions of Information Technology

Business value (considered a vague term) has not been considered by practitioners in decision making. Generally, the factors that attribute to the existing, as well as future performance of the organizations are grouped to construct business value domain. This scenario allows the business value to move beyond economic value and financial growth. On the contrary, all factors positively contributing to the organization can potentially be seen as business value. Taking the argument forward, business value can be seen encompassing factors like customer value, shareholder value, partner value, employee knowledge, societal value, managerial value and supplier value [12] [19].

Customer value is extremely important to the consumption process. Organizations try to create and assess customer value through product specifications, quality, and satisfaction. The organization needs to ensure that the product delivered to the customer exhibits expected quality while facilitating ease of use. The organization is susceptible to loss of image as well as profits in the absence of an acceptable customer value [13].

The shareholders expect decent returns out of the holdings in an organization. They expect to be rewarded with profits for the investments made by them. However, shareholder value is intertwined with customer value. Increasing customer value (quality enhancement through the implementation of information technology) causes the better performance of the organization resulting in higher returns for the shareholder, subsequently increasing the shareholder value [14].

The nature of business relationships determines partner values. Even though a partner is generally an external entity, but the partner is directly influenced by the activities managed within the organization. Situations like the stock-outs halt in production and change in specifications of products/services directly affect the partner value. Efficient handling of activities within an organization positively influences the partner value.

The managerial value represents the effectiveness and efficiency of the managerial decisions taken to support the organization in dealing with routine and ad-hoc challenges. This value also represents the ability to deal with uncertainties within an organization. Information technology plays the role of an enabler leading to productivity and ultimately to profitability of the organization [15].

The business value of information technology is represented as the performance of the organization at the process and organizational level, incorporating efficiency and competitiveness [16].

Assigning the business value to the information technology implementation has been bothering researchers and practitioners alike. Generally, the organizations resort to measuring the payoffs of information technology in three dimensions (capital budgeting, financial performance, and market valuation).

Out of the vast research literature, the pinpointed recommendation considers the alignment of information technology with strategy, structure, culture, process, and operationalization aspects. However, the research studies have failed to associate the business value of information technology with the systems perspective (subsystem activities). This gap is likely to limit the ability that an organization needs to have to realize the benefits of investment in information technology, as reported in failures in the information technology implementation [17].

A research study empirically tested the correlation between the implementation of information technology and select factors of business value (customer value, employee value, shareholder value, and managerial value). This research study concluded that information technology positively influences the business value factors considered in the research study [18].

Another research highlighted the role of information technology governance in the generation of business value. This research argued that effective information technology governance could positively contribute to business value. Effective information technology governance can ensure the right allocation of resources for better accountability and proper synchronization of resources with the business objectives of the organization [5].

## II. PROPOSED METHODOLOGY

The following block diagram of business operations was considered for establishing the business value constructs and underlying Information Technology enablement of business:

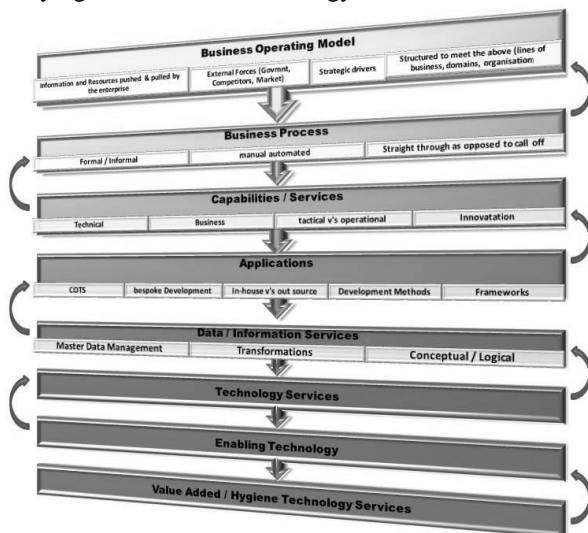


Figure 1: Business Operating Model and Information Technology Implementation

The architecture adopted from “Business Architecture Phase Business Model Reference” also recommends integration of critical processes with support processes to deliver the value to the end-user.

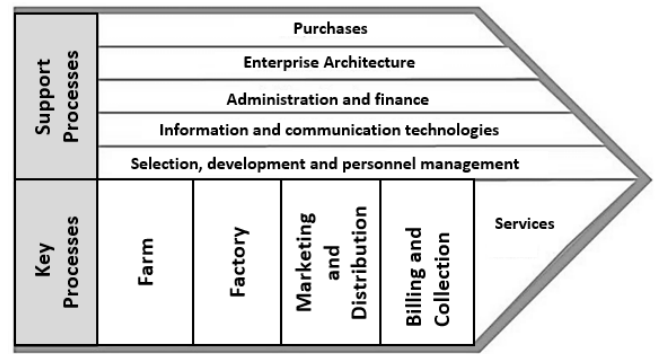


Figure 2: Value Chain (Business Architecture Phase Business Model Reference)

The primary data was collected from 300+ Indian organizations. Further, we have calculated the managerial value and shareholder value, whereas the data for employee satisfaction and customer value was collected through surveys with the questionnaire. We have used linear regression methods for testing four propositions.

Linear regression establishes relations between a scalar dependent variable (Y) with an independent variable (X) and is represented by  $y=ax+c$ . Other classifications mechanism were used for calculating correlation, mean, mode, variance, standard deviation, etc. The average values were calculated for all datasets.

Correlation tests examined the dependency of the dependent variable on an independent variable.

$$r = \frac{\text{Cov}(x,y)}{\sqrt{s_x^2 * s_y^2}}$$

Where Cov (x,y) or covariance is represented as:

$$\text{Cov}(x,y) = \frac{\sum(X - \bar{X})(Y - \bar{Y})}{n - 1}$$

A positive value inclined towards 1 represents dependency, whereas, a negative value inclined towards -1 represents the absence of dependency.

Finally, t-tests were conducted to examine four propositions for their respective validities.

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

## III. RESULT ANALYSIS

This study has partially supported past research work carried out in the area. This study has further suggested that the implementation of Information Technology positively influences customer satisfaction and shareholder value. **Table 1: Information Technology Implementation Extent, Customer Value, Employee Value**

Information Technology Implementation Extent		Customer Value		Employee Value	
Mean	44.64	Mean	95.9	Mean	94.5645
Standard Error	.90	Standard Error	.3993	Standard Error	0.3697

## Association of Business Value to Productivity through Information Technology

Median	39.16	Median	80.2	Median	79.77
Mode	#N/A	Mode	#N/A	Mode	#N/A
Standard Deviation	1.72	Standard Deviation	3.21	Standard Deviation	2.9776
Sample Variance	5.2	Sample Variance	7.9664	Sample Variance	7.8387

**Table 2: Information Technology Implementation Extent, Shareholder Value, Managerial Value**

Information Technology Implementation Extent		Shareholder Value (Economic investment)		Managerial Value (Organizational Value from Design)	
Mean	44.86	Mean	89.8	Mean	86.7738
Standard Error	.90	Standard Error	.3818	Standard Error	0.3752
Median	41.44	Median	88.9312	Median	84.1252
Mode	#N/A	Mode	#N/A	Mode	#N/A
Standard Deviation	1.70	Standard Deviation	2.77	Standard Deviation	3.0442
Sample Variance	5.2	Sample Variance	7.9443	Sample Variance	7.8234

### IV. CONCLUSION

There is no denial of the fact that the organizations are finding it challenging to rationalize the information technology investments vis-à-vis the business value outcomes. Though several research studies have pointed in the promising directions through empirical or summative approaches, still an association of business value generated by information technology to productivity demonstrated by the organizations remains a challenge.

In our understanding, the need of the hour is a standardized framework, which can be readily adopted by the organizations for assessment of business value generated and finally linking the same to the productivity constructs.

Also, the challenge of assessing intangible outcomes is hurting the business cases of investments in information technology. Though a research study has proposed to keep a longer time frame for assessing the intangible outcomes, still the organizations may find it hard to wait 5-7 years for assessment of intangible outcomes under constant criticism of information technology as 'cost center'.

We also feel that in the absence of credible frameworks, the providers of information technology can also collaborate with the organizations to develop, test and adopt new frameworks, which can enable an organization in assessing the business value and linking the same to the productivity constructs. These providers have to do away with redundant parameters like % increase in sales, % increase in customer satisfaction, % decrease in wastage, etc. and focus on more concrete, evidence-based outcomes, which can translate to business value outcomes and ultimately to productivity.

We also admit here that one framework may not be viable for all domains and verticals of organizations. There are specific unique pain points which vary from organization to organization, vertical to vertical and domain to domain. Therefore, a tested model with adaptation integration may help the organizations initially until they develop a standard framework unique to their respective organizations, verticals, and domains.

Unfortunately, no significant progress has been made in this regard, which is complicating the problem further resulting in questioning the information technology again and squeezing the funds.

We strongly believe that business value is generated with the information technology implementation leading to productivity enhancement in the organization. In the absence of conclusive evidence, this idea of information technology adoption will continue to get turned down frequently.

In this review of research literature, we have not been able to find conclusive and globally accepted evidence though the majority of the research literature has supported the fact that information technology generates business value leading to enhancement in productivity.

The organizations are still adopting information technology at the organizational level as well as at the process level. This adoption may be due to competitive pressures, regulations, modernization or ease of doing business (like video conferencing has eliminated the need to travel or the ability of the organizations to accept orders online 24/7).

Still, there is a need for conclusive research that encompasses organizations globally that can conclusively showcase the figures of business values and percentages of productivity for making a strong case for the adoption of information technology.

We conclude that nonmeasurable parameters of business value outcomes will continue to figure in business cases prompting the organizations to adopt information technology for the time being.

However, the organizations can continue to address information technology governance issues while ensuring strategic alignment of information technology with the organizations.

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