Impact of investments in information technology on the Tunisian firm performance

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Abstract:

This article identifies the impact of investments in IT on the performance of the Tunisian firms. The method of structural equation was adopted to conduct our exploratory and confirmatory analysis.

The impact of investments in IT on the performance is highly dependent on external factors such as the managerial strategies adopted, the Structural sophistication and the IT Sophistication. The effectiveness of such system depends on the degree of integration or assimilation of the technology. We have insisted on the term “alignment” because we believe that the effectiveness of the information technology derives from its ability to become an integral part of the whole organizational system.

Key words:

Business strategy, structural sophistication, IT sophistication, performance, alignment and Tunisian firm.

1- INTRODUCTION

The environment of the firms was marked during these last decades by major changes which contributed to the appearance of a new company called the “information society”. Became the important strategic arm, information monopolizes the attention of management researchers who try to support the installation of an optimal information system management which is in accordance with the strategic organizations of the company (Lacity and al., 2013).

Conscious of the strategic importance of information, IT investment is increasing. Indeed, these investments are in the order of 5302 million Dinars in 2010 and will reach 6300 million dinars in 2010, representing 10% of the total of the envisaged investment in Tunisia.

Thus, the telecommunication sector contributes to the growth of Tunisia with a rate of 24%. Given the importance of this sector, the government encourages only these investments. In this regard, the number of users of Internet increased from 410,000 to 1,294,910 users in 2012.

Our aim in this article is to explore the nature of the relationship between IT and performance of Tunisian firms. If the impact of IT investment on the performance seems mixed, it is not the same for the impact of performance on IT investment. This causal relationship shows that only successful companies and having important financial capacity can invest in IT.

Thus, the issue of performance improvement justifies the interest we pay to the impact of IT on performance firm. Indeed, much research, we adhere to, believe that technology in itself does not necessarily lead to improved performance. However, it is the ability and the way these technologies are appropriate can have an impact on performance.

The performance evaluation is therefore an important activity with any technological, strategic or organizational change in this company. We planned to treat the problems of the impact of IT on the performance by devoting a first part to the presentation of the review of literature. As for the second part, we will be interested in the respective impact of strategy, structural sophistication and IT Sophistication on the firm performance.

2. THE IMPACT OF IT INVESTMENT ON FIRM PERFORMANCE: THEORETICAL CONTRIBUTION MIXED

The impact of information technology on business performance was often highlighted in the literature. The researches done on this subject seem very heterogeneous and contradictory. Indeed, some studies have shown that IT doesn’t improve the company's performance. (Brynjolfsson and Hitt (2003); Mingfang and al., 1999; Ing-Lon and al., 2006).

Other studies have shown that the most successful companies are those that invest a lot in IT since this investment improves the flow of resources (Reix, 2004), help to develop internal communication within firms, enhance the communication process between companies and their suppliers and influenced sales performance. (Budiarto and al., 2015).

Barua and al. (1995) believe is very difficult to estimate the individual benefits of IT in an environment where the unit contribution of information technology has no meaning outside the interoperable system which it integrates.
During the 30 years, IT alignment and firm performance was the first preoccupation of managers researches in 2011 after being in the second place in 2010 (Mithas and al., 2012). The business leaders continue to consider the IT as an integral driver of efficiency throughout the business and therefore focus on initiatives that enhance the maturity of alignment between IT and business (Luftman and al., 2013). Thus, our first research hypothesis is as follows:

- H1: “IT alignment has a positive impact on firm performance”

2-1 Business strategy

The IT represents a way for the organization to acquire a competitive advantage and to achieve its financial and non-financial goals (Porter and Millar, 1985). These technologies are redefining the strategic objectives of the firm, the manner how she acts, or negotiates with its customers and suppliers (Mingfang and al., 1999).

Become indispensable for the good running of the company, IT can also enable the Organization to be listen by the environment, its sector and more particularly of the competition. Miles and al., (2003) have proposed a typology which contains four strategic behaviors: exploration, analysis, response and defense. The companies are supposed to adopt a type of behavior rather than another according to their goals and their perceptions of the environment.

This typology has been the subject of several researches and has been operationalized by various researchers (Brown and al., 1998; Luftman and al., 2013). They have correspond to each of these four types of strategic activities, the type of technological deployment adapted.

For example, Ing-Lon and al., (2006) indicate that the performance of the company depends on the relationship between the design of IT and the strategic retainers of the company. As well, the information management systems prove to be more effective in the companies using a prospectory strategy rather than a defender strategy.

On the other hand, Lu and al., (2011), felt that the role of the IT has changed profoundly over the past three decades since they are increasingly used for strategic purposes or competitive in transforming their organizational structures. Moreover, Johnson and Lederer (2010) referred to the strategic dimensions of the model STROBE (Strategic Orientation of Business Enterprises) of Venkatraman (1989) to measure the impact of IT on firm performance. The relationship between strategic alignment of IT and firm performance has been verified in many studies (Raymond and al., 1995; Sabherwal and Chan, 2001; Baker and al., 2011; Mithas and al., 2012). So we advance our second hypothesis:

- H2: “The alignment of business strategy has a positive impact on firm performance”.

2-2 Structural sophistication

The structure of the firm is regarded as the foundation of its strategic and technological choices. IT are expected to enable the decentralization of management and the delegation of decision-making authority by facilitating the dissemination and sharing of information within the organization (Croteau and Bergeron, 2001). A complex structure is characterized by framing mechanisms of formalization and more sophisticated specialization, which in turn require the information technology (Brown and Magill 1998). A complex structure is characterized by the mechanisms of coaching, formalization and specialization more developed which in turn require the information technology.

Toms and al., (2005) present a multidimensional model to conceptualize the notion of structural sophistication in the research on system of information organizational. According to these authors, the sophistication is defined under two dimensions to know: the use of information technologies and their management.

We believe that a management and the efficient and effective use of the information facilitate its integration in the organizational process. This integration is necessary to maintain a Unit and a consistency in the operation of the business. It allows to take into account the transverse character of relations between services.

The integration of IT within organizations is done in a progressive manner, but especially in trying to meet the objectives of the business. In this regard, Luftman (2000), notes that degree of integration of IT in the organization makes a company more efficient than another. As well, the capacity of different persons or units to process and transmit the information intra and inter-organizational determines to a large extent the performance of enterprises. Mingfang and al., (1999) introduce the concept of assimilation of IT within the organizational structure which defined as « the degree of dissemination of IT in the organization and the additional efficiencies allowed through their use ».

It is as well as IT has an essential role on the plan of the integration. They allow to make the information available to all hierarchical levels in the transmitting, in real time, regardless of the geographic locations, (Chen 2010). Thus, we try to test the following hypothesis:

- H3: “The alignment of structural sophistication has a positive impact on firm performance”.

2-3- IT Sophistication

The analysis of the impact of sophistication of IT on the firm performance has been the subject for several years of a debate around the theme of “paradox of productivity” declared by Solow, “We see computers everywhere except in the productivity statistics”.

The merit of this joke has been to initiate numerous research that have served to underline the difficulty to measure the diffusion of these technologies as well as their effects in terms of productivity. (Budiarto and al., 2015)
While some have found that investments in IT have been associated with the substantial increase in the income (Brynjolfsson and Hitt, 2003), many have failed to demonstrate that it can contribute to a lower result. For example, Li and al., (2010) found no relationship between the budgets of information systems and performance. While Luftman and al., (2013) have observed that an intensive use of information technologies has characterized companies with a very high level or very low profitability. Using the time series on more than 700 banks on a period of eight years, Alpar and Kim (1990) could not confirm the existence of a relationship between the expenditures for information processing and the return on equity.

Venkatraman (1989) has shown that the real benefits of IT appears after transformation from top to bottom of the strategic choices of the firm, its internal processes, of the computer platform and the IT architecture. It affirms that is the dynamic alignment between the strategic context of the business and its IT infrastructure contributes to increasing the efficiency and effectiveness. The theorists of the organizations are concentrated on the study of models of contingency that share the fundamental places that the context and the structure must align together if the organization wishes to be more efficient (Drazin and Van de Ven, 1985).

In the strategic management, the general assumption of the theory of contingency is that "no strategy is universally superior, regardless of the environmental or organizational context" (Venkatraman, 1989).

The models of contingency, which assume that there is no better way to organize, have also been proposed and tested in the IT, whether to study the strategies of detection of needs in information, the individual impacts of IT, the impact of IT on the knowledge or on the resolution performance of tasks. The models of contingency also appear to hold some promise in the study of its impact on firm performance. The question of the relationship between the Information Technology (IT) and the economy, the firm or individual performance has been widely discussed during the last two decades.

Several explanations have been data for the paradox of productivity. Some are more methodological in nature such that the delays due to the study and the alignment, the methodologies unsatisfactory, and the uncertain models (Brynjolfsson and Hitt, 2003).

Another explanation for the paradox of productivity belongs to a perspective on the theory of contingency. In this regard, we think that the theory of contingency operations can provide a theoretical basis valid for studying the report between the IT and the performance (Iivari, 1992). The basic argument for this explanation is that the real impact of the technologies of the information is true, but all in the aligning with its strategy, its structure and its environment.

For example, Raymond and al., (1995) have found that the alignment between the commercial strategy and IT strategy enable the growth and profitability of business. Even more, Chan and al. (1993) have observed significant relationships between the strategic direction, the strategy of the IT, the efficiency of IT and the performance. Sabherwal and Chan (2001) have also found that the alignment between the success factors of the Organization and the sophistication of the IT facilitates the performance of the Organization. Therefore we will test the following hypothesis:

-H4: "The alignment of IT sophistication has a positive impact on firm performance".

The evaluation of the performance is a complex activity and is even more a necessity with any technological change, strategic or commercial operating within this business. It is as well, that the researchers (Baker and al., 2011 ; Chen, 2010) realize more and more that the relationship between the Information Technology and the firm performance is multi dimensional.

The information technology research, in particular in information systems strategy (Delone and McLean, 1992; Seddon, 1997), we has oriented toward the adoption of a theoretical perspective widely used in research in information systems: the perspective of "fit" or "strategic alignment," entered in the theory of contingency according to which the firm performance is the result of the congruence "fit" between two or several factors such as the strategy, structure, technology, the environment (Weill and Olson, 1989). While they confirm that contingency theory has contributed to the expansion of knowledge, several authors have deplored that the researchers were not careful or vigilant enough defining the concept of the alignment - which is central in any contingency model, and choosing the appropriate approach to define alignment (Iivari, 1992; Venkatraman, 1989; Weill and Olson, 1989).

2-4-Concept of alignment

Information systems researches are more and more interested in the concept of alignment. The ambiguity of this concept is the origin of various definitions proposed by several authors. The alignment is generally considered as an imperative condition for the evolution of businesses (Sabherwal and Chan, 2001).

Woolfe and Casch (1992) argue that the strategic alignment is the resultant of a harmonization of the strategy with its IT. Henderson and Venkatraman (1993) have defined the alignment as the whole relationship, with a double meaning, between the four dimensions of the Alignment: the business strategy, the IT strategy, the sophistication structure and sophistication of IT. As well, organizational performance is the result of the interaction of these components. In the same order of ideas, Papp (1995), defines the strategic alignment as the appropriate use of IT at the level of integration and the development of organizational strategies in order to improve the performance of the firm. As to Reich and Benbasat (1996), they consider the alignment as "the degree to which the mission, objectives and plans of IT support and are supported by the mission, the objectives and the business plans of the company."

On one part, Chan and Huff (1997), have identified three levels allowing businesses to achieve alignment: the conscience, the integration and alignment. The first level indicates that the firm has reached a level of consciousness in the recognition
and realization of the importance of having a so closely connecting with the organization of the company. The second level is the integration of operational functions and activities of IT. And, the last level is the IT alignment with the basic strategies of the Organization and the key competencies. On the other part, Luftman (2000) defines the alignment as “the activities that attempt to achieve goals that are cohesive through it and other functional organizations and apply it in an appropriate direction while being in harmony with the business strategies, goals and the needs of the company.”

Luftman (2000) have proposed a more detailed definition, they thought that the alignment is an ongoing dynamic process ensuring the harmony between all the components of the relationship IT/activity of the company in order to improve the performance of the company.

In addition, Hirschheim and Sabherwal (2001) have shown that the strategic IT alignment is a process of adaptations and ongoing changes to achieve harmony between the IT strategy with the business strategy.

However, the operationalization of this concept varies considerably from one industry to another, from one firm to another, from one department to another within the same company. Each interest group has its own definition of the performance.

Thus, in our research we will adopt the alignment as internal coherence between multiple contingencies: Strategic business, structural sophistication and IT’s sophistication that affects the performance.

The figure below shows the conceptual model we tested:

![Conceptual Model]

This figure shows that, if a firm wants to generate best performance levels, it should align its IT strategy with its strategy and its sophisticated structure. In other words, firms can achieve best performance levels by aligning IT strategy with corporate strategy and structure.

3. Design Research

To study the impact of the alignment of IT on the Tunisian firm performance, we opted for firms of different sizes and operative in different business sectors (service sector, banking sector, and industrial sector). We have collected 211 responses from 650 questionnaires sent which presents a final rate of responses of 32.46% (Table 1). We note that we had to mail the questionnaire more than once to get a satisfactory number of respondents.

<table>
<thead>
<tr>
<th>Questionnaire面面</th>
<th>Number of responses</th>
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<tbody>
<tr>
<td>Face to face</td>
<td>35 responses</td>
</tr>
<tr>
<td>Posted 1st time</td>
<td>68 responses (rate of response = 19.42%), 350 questionnaires sent.</td>
</tr>
<tr>
<td>Posted 2nd time</td>
<td>71 responses (rate of response = 47.33%), 100 questionnaires sent.</td>
</tr>
<tr>
<td>Posted 3rd time</td>
<td>37 responses (rate of response = 74%), 50 questionnaires sent.</td>
</tr>
<tr>
<td>Posted 4th time</td>
<td>35 responses (rate of response = 35%), 100 questionnaires sent.</td>
</tr>
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</table>
3.1. MEASURES OF VARIABLES

The variables used in our model are measured by items from previous research, in particular those of Venkatramman (1989) and Rival (2008) and adapted to our problem, to attend the purpose of our research. These items were measured by Likert scales with 5 points.

To analyze data, we have proceeded on two stages. First, we have done a descriptive analyze by using SPSS software (Statistical Package for the Social Sciences) which has allowed us to describe our sample and to analyze measurement scales. This factorial analyze is used to verify scales validity and to confirm factors researched. Second, we have used AMOS 16.0 (Analyses Moments Structures) software for modeling structural equations, to test our research model. This method allowed us to evaluate, simultaneously, our propositions and measurements for the model in question.

3.2. ANALYSIS MODEL

The principal aim of factor analysis consists on structuring items and summarizing them in a small number of variables named factors. This method allows us to select from a set of initial items those which predominate in describing phenomena.

For our first construct "Business strategy" we got three factors. The first is the "implication of managers in strategy of partenariat" (IMP_DIR), the second is the "implication of the IT managers in the management of firms" (IMP_TIC) and finally, the last factor corresponds to the "Valuation of IT" (VAL_TIC). The two factors obtained to measure built our second "sophistication of IT". They correspond to “organizational evolution” (EVO_ORG) and the “degree of integration of IT” (DEG_INT). As for construct "sophistication of IT", two factors were identified which are “complementarily investments” (COMP_INVTIC) and «technological evolutions» (EVO_TECH). The last two factors obtained to measure the construct "firm performance" are “growth” (PERF_CROIS) and "profitability" (PERF_RENT).

3.3. ESTIMATED MODEL

Standardized estimation coefficients are another means of evaluation. The coefficients closely approximate effect sizes shown by beta weights in regression. Coefficients near zero have little, if any, substantive effect, whereas an increase in values corresponds to increased importance in the causal relationships. These results are summarized in the Table 2:

<table>
<thead>
<tr>
<th>Standardised estimation coefficient</th>
<th>Estimator</th>
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<tbody>
<tr>
<td>BUSINSTRAT &lt;---- ALIGNEMENT</td>
<td>0,570</td>
</tr>
<tr>
<td>SPHSTRUCT &lt;---- ALIGNEMENT</td>
<td>0,776</td>
</tr>
<tr>
<td>SOPHTESCH &lt;---- ALIGNEMENT</td>
<td>0,619</td>
</tr>
<tr>
<td>PERF &lt;---- ALIGNEMENT</td>
<td>0,590</td>
</tr>
<tr>
<td>VALTIC &lt;- --- BUSINTSTRAT</td>
<td>0,604</td>
</tr>
<tr>
<td>IMPTIC &lt;- --- BUSINTSTRAT</td>
<td>0,588</td>
</tr>
<tr>
<td>IMPDIR &lt;- --- BUSINTSTRAT</td>
<td>0,619</td>
</tr>
<tr>
<td>DEGINT &lt;- --- SOPHSTRUCT</td>
<td>0,801</td>
</tr>
<tr>
<td>EVOOLORG &lt;- --- SOPHSTRUCT</td>
<td>0,558</td>
</tr>
<tr>
<td>COMPINVTIC &lt;- --- SOPHTECH</td>
<td>0,721</td>
</tr>
<tr>
<td>EVOTIC &lt;- --- SOPHTECH</td>
<td>0,859</td>
</tr>
<tr>
<td>RENTA &lt;- --- PERF</td>
<td>0,888</td>
</tr>
<tr>
<td>CROISS &lt;- --- PERF</td>
<td>0,726</td>
</tr>
</tbody>
</table>

The AFC 2nd order has allowed a satisfactory verification of the existence of the construct "IT Alignment" established from the dimensions business strategic, structural sophistication and sophistication of IT. The AFC 2nd order also attests to the reliability as well as convergent validity of the Constructed of 2nd order of the research model. It is now possible to test our model.

All the adjustment indices selected meet the target thresholds. The review of the various indices shows that the model is acceptable and that it fits well enough to empirical data for that the estimates of the parameters are to be reliable.
We propose to verify that the constructed alignment of IT emerge from the co-variation between the built strategic alignment, structural alignment and technology alignment in determining the performance of the company. (Figure 2)

After testing the model using structural equations, it appears that the conditions tested model fit to the data is generally followed: χ²/dl value is less than 5, it equals 3.29. The coefficients GFI and AGFI are above the standard exploratory research mentioned (> 0.9). The GFI and AGFI = 0.950 = 0.918, reflect a good "fit" between model and data. The index is equal to 0.076 CMA and the RMSEA is equal to 0.089, the side of indices to judge the quality of model fit such as NFI and CFI, they have respectively the following values of 0.902 and 0.924. According to the results of assessment indices used, we can conclude that the proposed model fit is acceptable. Therefore, we can retain the estimates of regression coefficients and percentages of explained variance R² for variables, which will allow us to affirm or refute our main research hypothesis.

The regression coefficient between the alignment of IT and firm performance of 0.36 is significant (Student t test of | 2.232 |). This result allows us to confirm H1 supposing "the alignment of IT positively affects firm performance."

4. Discussion of Results

Our results confirm those of previous work in IT that have highlighted the close link between the alignment of IT and firm performance [Chan and Huff, 1993; Chan and al., (1997); Croteau and Bergeron (2001) and Kearns and Lederer (2003)].

4.1. Business Strategy and Firm Performance

From the results obtained, we found that strategic factors are crucial in enhancing the firm's performance. More precisely, "the implication of managers from different departments in developing IT strategy" has an important role in the contribution of IT to firm performance. Certainly, more managers participate in IT project; more they are recognizing the importance of the strategic role of IT. Subsequently, they provide continuous tracking of the evolution of their business.
They organize monthly review meetings with the department, for a general account of technological activity. Chan and Reich (2007) and Luftman (2000) also highlighted the importance of the participation of leaders in the IT strategy to ensure firm performance. Moreover the implication of managers, we emphasize that the contribution of the strategic alignment of IT to firm performance is closely linked to the principal role of the IT department and valuation of IT. First, the performance observed can be explained by including the central role taken by the IT department. This can be explained by the central role that was given to the IT department at various functions within the company and thus improving firm performance. Furthermore, we also emphasize that the relationship of IT managers with managers of firms determines the importance of IT. They work together to improve business objectives, thus proves the conscience of the leaders of the central role of IT. IT becomes the fundamental element in the development and consolidation of the business strategy of the firm. The impact of the strategic alignment of IT on firm performance has been proven in various IT researches such as Bergeron and al., (2001), Rival (2008).

4.2. STRUCTURAL SOPHISTICATION AND FIRM PERFORMANCE

Improving performance through organizational evolution can be explained by the fact that IT has improved the way to work. There is a better flow of information. It has become accessible to all levels and available at any time. Coordination between services is greatly increased. Decision making is greatly improved thanks to the IT they have become clearer, more efficient and faster. The second factor is the integration of IT within the company. In fact, IT can create a common database, a very fast access to information, better sharing and better communication between the various services. Information has become automated, updated and instantly available. As an explication to this result we can stress that during the phase of the IT implementation, there's a collaboration of all members working. Therefore, the company is able to identify and integrate in the system all the information needed. Moreover, integration and transparency of data and increased accessibility to information in real time have to constantly assess the value added of each activity. The work of Yu Yuan Hung and al. (2010) stressing that technology integration is the most important factor to explain the value delivered to the firm, confirm our results.

4.3. IT SOPHISTICATION AND FIRM PERFORMANCE

The result of structural equation has concluded that no link exists between IT sophistication alignment and firm performance. Most respondents noted that they don't have received formation on technologies that their firms have developed. This leads a lack of motivation of employees. Therefore, be a leader in IT investment does not always means having a better performance. It seems contradict some previous researches that consider the sophistical IT as key to improving firm performance [(Luftman and al., (2013), Chen2010,Toms and al., (2005), Bergeron and al., (2001)].

5- CONCLUSION

Our objective in this research was to demonstrate that the alignment of IT with the business strategy, the Structural sophistication and IT sophistication can have a decisive influence on the firm performance.

Our main conclusion is to underline the crucial role of the integration of IT in the organizational process. The impact of IT remains neutral if this integration has not been favored. Then, as we have noted earlier, the research work on IT the alignment are little many in developing countries. Therefore, our work has contributed on the one hand, to fill the lack of registered research at this level and on the other hand, to enrich and deepen our knowledge in relation to the problematic studied.

However, it is clear from the literature that there are two different conceptualizations of the alignment. The first is the alignment as a continuous process (dynamic aspect), which requires specific actions aimed at ensuring a better understanding of the mechanisms and processes by which the phenomenon of alignment is built over time. The second is the alignment as an end in itself (static aspect), which focuses on measures of the history and of the results of the alignment (generally the performance of the company).

The consideration of the two perspectives of the alignment is likely to be more difficult, but more beneficial (Kearns and Lederer, 2003). Furthermore, the taking into account of the temporal variable offers the possibility of assessing the performance of the company in the long term. Indeed, according to Reich and Benbasat (1996 and 2000), some factors affect differently the alignment either the short-term or long-term.

Taking the example of the dynamo David (1990), any major technological innovation has an effect on the system overall productive after a certain period of adaptation. As well, the positive effects of the electricity on the productivity would not be appeared at the macro-economic level that 15 years after the emergence of the dynamo [Sabherwal and Chan (2001)].

Similarly Rong-Ruey and al., (2006) have shown that the investments in new technologies do not have an immediate impact on the firm performance, it must wait at least 2 or 3 years for the training of users. As well, future research should focus on the time factor for well explore the relationship between IT and the firm performance.

Then, the critic relating to research on the IT alignment, show that the alignment is not successful because the strategy is not a clear concept due to various circumstances such as, the turbulent and unpredictable leaving that the leaders change their business strategies (Luftman and al., 2013). For consequence, the adjustment needs of the business change according to the type of strategy to adopt. Of this fact, the impact of the alignment on the performance is not the same (Sabherwal and Chan, 2001; Croteau and Bergeron, 2001).
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