

THE IMPACT OF STRATEGIC INFORMATION SYSTEM AND STRATEGIC DESIGN ON ORGANIZATION'S COMPETITIVENESS: A FIELD STUDY

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ABSTRACT

The Information era has imposed so many revolutions. This study aims to investigate the direct and indirect effects of strategic Information Systems (IS) capability on organization's competitiveness through its contribution on the effectiveness and efficiency of strategic design process. Mixed triangulation approach has been used by combining both qualitative and quantitative analysis to explore and empirical examine the research model. Statistical analyses are employed based on the data gathered from 34 pharmaceutical manufactures' companies in Egypt (public, local private and multinational). The results indicate that: (1) the strategic Information System (IS) capability positively affect the effectiveness and efficiency of strategic design process; (2) the strategic IS capability positively impact organization's competitiveness through affecting strategic design positively.

Keywords: Strategic Information System, Information System Capability, Strategic Design, Strategic/ Information System Alignment, Organization Competitiveness.

INTRODUCTION

Information has emerged as an agent of integration and the enabler of new competitiveness for today's organizations in such dynamic global marketplace (Hemmatfar et al., 2010). Business trends in the organizations of the 21st century have emerged around supplier and customer relationships, global communications, knowledge management, competitive intelligence, social innovation and networking based on the Information Systems' (IS) innovation (Yang et al., 2015).

During the last two decades, there has been a growing realization of the need to make ISs of strategic importance to an organization. Strategic ISs (SIS) “are systems that support or shape a business unit's competitive strategy and it is characterized by its ability to significantly change the manner in which business is conducted, in order to give the corporate strategic competitive advantage” (Hemmatfar et al., 2010). In this study, the meaning of utilizing IS strategically in strategic design is about the ability of top management teams to acquire and process strategically relevant information about organization and its environment that can assist them in designing competitive strategies for building up and sustaining its competitiveness.

It has been realized that the lack of strategic alignment between Information System (IS) and organizational strategies has been frequently reported as an important problem in surveys of business executives and IT managers. Especially, the gap between IT and business strategies has been frequently reported in developing countries (Jorfi et al., 2017). Hence, for the purpose of

this study to enhance the strategic role of Information System (IS) in the effectiveness and efficiency of the strategic design, the researcher developed a model proposing a positive relationship between three constructs: strategic IS capability as an independent variable, strategic design as a mediating variable and organization's competitiveness as a dependent variable.

According to MacKinnon et al. (2008), the integration of information systems and technology with key business processes in particular strategic design process allows firms to rapidly adapt to changing requirements and exploit emerging markets. Specifically, Strategic ISs (SIS) assist in making timely business decisions and designing competitive strategies for the organization's future to retain and extend its competitiveness (Lau & Pun, 2000).

Consequently, the research question that forms the basis for this study is,

“To what extent the contribution of strategic Information system capabilities in the effectiveness and efficiency of strategic design impact the organization's competitiveness”.

LITERATURE REVIEW

Strategic Information System

Many business leaders and strategy scholars agree that the ability to effectively manage information and knowledge within an organization has become critically important and provides a basis of a competitive advantage (Yoon, 2011).

The strategic management discipline has long sought to elicit the sources of sustainable competitive advantage and there is a significant body of research focusing on this objective and so Information System (IS) management field has exerted great efforts in the same direction, there are recent researches arguing that Information Technology (IT) alone is unlikely to be a source of sustainable competitive advantage as it is easily to be replicated by competitors (Peppard & Ward, 2004). Hence, Strategic IS capability pioneers the beginning of a new era of IS management, in which organizations can continuously derive and leverage value through Information Systems (IS) that is implicitly embedded within the fabric of the organization (Khani et al., 2011).

According to Stoel & Muhanna (2009), Strategic Information System (IS) capability is *“a complex group of IT-related resources, knowledge and skills practiced through organizational processes and empower the organization to utilize IS/IT assets for desired objectives. In short, the IS capability is embedded within the fabric of the organization”.*

Strategic Design

Alongside with the late 1990s forward thinkers in academia and industry have identified the role of design at strategic creation for enhancing the organization's strategic goals through vision leadership (Holland & Lam, 2014). This line of thought goes back to *“design school”* proposed by Mintzberg (1990), one of the schools of thoughts on strategy proposes a simple model that views the process as one of design to achieve an essential strategic fit between external threats and opportunities and internal distinctive competences. According to Montuori (2003) strategic design defined as *“a journey of creation. It is a journey toward a desired future state, which we define for ourselves and want to realize”.*

Strategic design is an analytical ongoing process that assesses the business and its environment and due to high level of uncertainty and ambiguity of this process, it requires using

broad organizational knowledge and strategic information (Meroni, 2008; Nooriaiee & Pour, 2013).

Recently, it has been widely realized in literature that the collaboration of internal and external stakeholders from the early beginning has emerged as a new necessity for successful strategic design. Holland & Lam (2014) clarified how strategic design is about using design management to drive corporate strategic goals. They argue that it creates vision and integrates and orchestrates collaboration across disciplines in order to deliver real value to all stakeholders through creative solutions to business, social and environmental problems.

Business strategy and strategic information system are inextricably linked. The strategic information that executives needs for designing strategies is based on a broad range of strategic ISs such as ERP, CRM, SCM and Business Intelligence (BI) that process data related to the organization and its environment. Strategic ISs are very useful for preparing and interpreting strategic information for being used at process of developing useful organizational strategies (Nooriaiee & Pour, 2013). In addition, Shujahat et al. (2017) developed a strategic model based on lens of knowledge management and competitive intelligence coordination, arguing that both are effective tools to assess the current and potential internal and external environment.

Hence, the potential contributions of different strategic ISs throughout the strategic design process have been widely recognized in literature, and can be summarized as:

1. Provision to real-time, precise and interactive information about market and business performance.
2. Scanning, extracting, forecasting and disseminating strategic knowledge about market demand, customer preferences and other external market environmental trends such as emerging opportunities and critical trends.
3. Facilities collaboration and involvement of external and internal stakeholders as a way to reach a shared mental representations and commonly interpretations.

Organization's Competitiveness

Organization's competitiveness is a complex and multi-dimensional concept that should be analyzed in a continuous dynamics (Radu & Popesu, 2011). In today's information intensive business environment, dynamic capabilities, flexibility, and adaptability are becoming more important sources of competitiveness (Ajitabh & Momaya, 2004; Ahmad & Schroeder, 2011). Lii & Kuo (2016) used a comprehensive approach and defined organization's competitiveness as "*a manufacturer's capacity to provide superior quality, delivery, and flexibility at a low cost*"; they divide competitiveness into capability indicators and firm performance. Such comprehensive approach has been used by the researcher as a basis for measuring organization's competitiveness construct.

Strategic IS Alignment

For several decades, the alignment of IT and business strategy has been among the top concerns of the business leaders for improving their organizational performance. Chan et al. (2006) defined Strategic information systems alignment, as the degree to which the mission, objectives and plans contained in the business strategy are shared and supported by IS strategy. As cited in Jorfi et al. (2017), the strategic alignment between IT and business refers to applying IT in an appropriate and timely manner, in harmony with business strategies, goals and needs.

Chang (2011) developed a Coordination Strategy IS Framework, arguing that the well-designed strategic information systems play an important role to enhance the flow of precise

strategic information involved in the designing process through scanning, analyzing, storing and communicating the information within the organization in a particular format that assist business managers in designing their strategies.

Numbers of models have been developed using “*content approach*” to examine the impact of strategic Information system and business strategy orientations alignment on perceived business performance such as Chan et al. (1997), Sabherwal & Chan (2001), and Chan et al. (2006), and It has been concluded that the alignment between strategic IS and Business strategy orientations have positive impact on business performance. While in this study the researcher used the “*process approach*” for examining the relationship of strategic IS and strategic design process on organization’s competitiveness.

RESEARCH METHODOLOGY

Research Problem and Objectives

The research problem can be stated as “*The inconsistent flow of strategic relevant information about the organization and its environment involved in strategic design process to executives and senior managers, that could lead to undermine the corporate strategy, decrease organization performance and affect corporate ability to enact critical changes in its corporate strategy, accordingly, this leads to failing to take into consideration any future requirements or exploiting major strategic opportunities*”.

This study seeks to contribute to the literature by pursuing three specific objectives:

1. To explore the strategic role and extent of the usage of the strategic Information Systems (IS) among the pharmaceutical manufactures’ companies sectors (public, local private, multinational).
2. To measure the impact of internally and externally focused Information System (IS) capabilities on strategic design.
3. To measure the impact of internally and externally focused Information System (IS) capabilities on organization’s competitiveness through its contribution on the effectiveness and efficiency of strategic design.

Research Model and Measurement

According to the literature gap analysis and research objectives, an empirical research model has been developed proposing a positive relationship between three main constructs: Independent variable (strategic IS capability), mediating variable (strategic design) and dependent variable (organization’s competitiveness) (Figure 1).

First, Strategic IS capability was measured by the measurement developed by Stoel & Muhanna (2009), it has been classified into two main categories (Internally and externally focused IS capabilities). Internally-focused IS capability sub-divided into (IS Infrastructure, IS business partnerships, IS knowledge and technical skills). Externally-focused IS capabilities classified into external relationship management and competitive intelligence.

Second, It has been widely recognized that the most common and basic attributes for successful strategic design process are being future-oriented through developing business vision and mission, conducting ongoing environmental scanning, analyzing and choosing the best fit business strategies and involving and collaborating internal and external stakeholders from the early beginning. Thus, according to the categorization explored by Acur & Englyst (2006), Friedel & Liedtka (2008), Meroni (2008) and Kağan & Kurtb (2016), Strategic design construct

was measured in terms of the four main attributes: future-orientation, environmental scanning, strategic choice, and collaboration.

Finally, Organization's competitiveness was measured by a multi-dimensional scale developed by Lii & Kuo (2016); the scale combined the competitive qualitative capabilities (quality, convenience, flexibility, innovation and cost) and firm performance quantitative indicators (market share, sales growth and total sales).

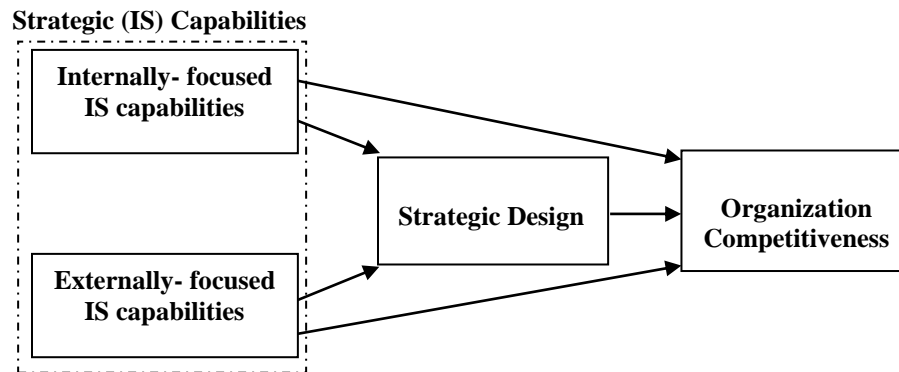


FIGURE 1
PROPOSED RESEARCH MODEL

Research Hypothesis

H₁: Internally- focused information system (IS) capabilities will positively affect Strategic Design.

H₂: Externally- focused information system (IS) capabilities will positively affect Strategic Design.

H₃: Internally- focused information system (IS) capabilities will positively affect Organization's competitiveness.

H₄: Externally- focused information system (IS) capabilities will positively affect Organization's competitiveness.

H₅: Strategy design will positively affects Organization's competitiveness.

H₆: Internally- focused information system (IS) capabilities will positively affect Organization's competitiveness through affecting strategic design positively.

H₇: Externally- focused information system (IS) capabilities will positively affect Organization's competitiveness through affecting strategic design positively.

Research Methodology

The purpose of the research is to investigate the direct and indirect effects of strategic Information System (IS) capability on organization's competitiveness through its strategic contribution in the effectiveness and efficiency of strategic design process. Thus a mixed method approach and specifically triangulation method (i.e., merge qualitative and quantitative data) has been used to develop a rich insight and deep understanding of the research proposed phenomena. Two questionnaires were designed and collected from both executive managers and Information technology managers.

The targeted population of interest was around (90) licensed pharmaceutical manufactures companies in the Egyptian pharmaceutical industry throughout its three main sectors, around (179) questionnaires have been collected from 34 companies (11 public, 18 local private and 5 multinational companies). In addition, ninety one (91) In-depth interviews have been conducted with both senior managers and Information system managers.

RESULTS AND DISCUSSION

Field Study Results

A comparative analysis has been conducted to explore the strategic IS capability among the three sectors of pharmaceutical companies (public, local private and MNCs) and its strategic role in the strategic design process.

Firstly, it has been realized that there are quite distinguishable differences among the three sectors on the strategic design level especially their future-orientation by which, MNCs future orientation efforts are directed towards achieving science leadership through discovery and development of small molecules and biologics medications and support such vision by investing billions of dollars and euros towards research and development. While the local private companies' future orientation efforts focus mainly towards their market leadership position and they vary according to targeted IMS rank, some of them target top 5, 10 or 20 sales rank position in IMS reports.

Second, It was apparently distinguishable the differences of strategic IS capabilities among the three sectors. MNCs are far advanced in the strategic ISs varieties and their Information system staffs are very knowledgeable in both technical and business knowledge, followed by local private and public sectors.

Third, the differences in the strategic role of IS capability among the three sector return to the different challenges faced by the IS departments in each sector: (1) In public sector, there are bureaucratic work flow, the technical and business knowledge for IS staff are limited, limited financial support for IS and poor competitiveness culture; (2) In private sector there are restricted internal departmental collaboration among IS and other business functional areas and limited top management support for IS department role; (3) In Multinational sector, IS department faces difficulties in system customization to the Egyptian pharmaceutical business workflow.

Reliability and Validity Analysis

Cronbach's alpha analysis was used to measure the reliability of internal consistency of the questionnaires. The senior manager questionnaire achieved Cronbach's alpha reliability value of 0.981 and 0.975 for information system questionnaire which reflects acceptable high internal consistency reliability where Cronbach's alpha coefficient above 0.7 (Wells & Wollack, 2003) (Table 1).

Table 1
RESULTS OF CRONBACH'S ALPHA FOR RESEARCH QUESTIONNAIRES

RESEARCH VARIABLE	N of Items	Cronbach's Alpha
INF1: IS Infrastructure	4	0.896
INF2: IS business partnerships	5	0.877
INF3: IS knowledge and technical skills	4	0.881
EXF1: External relationship management	5	0.845
EXF2: Competitive intelligence	11	0.957
SDF1: Future-oriented	13	0.920
SDF2: Environmental scanning	9	0.956
SDF3: Strategic choice	10	0.927
SDF4: Collaboration	10	0.941
OCF1: Competitive capabilities	14	0.936
OCF2: Firm performance	4	0.937

According to Hair et al. (2010), face/content validity can be tested based on the researcher and experts' judgment. For this study content validity was firstly assessed through 11- in depth interviews with senior managers in the preliminary exploratory study before field work data collection and based on their concerns and comments the measures items were modified. And finally were verified through 91 in-depth-interviews with senior manager and information system managers working in pharmaceutical companies.

Descriptive Analysis

The Strategic Information systems (ERP, CRM, SCM, data mining and data warehouse and Business intelligence) that used in acquiring, scanning, analyzing, and disseminating strategic knowledge and competitive intelligence, are far advanced in MNCs, followed by local private and public sectors, as shown in Figure 2.

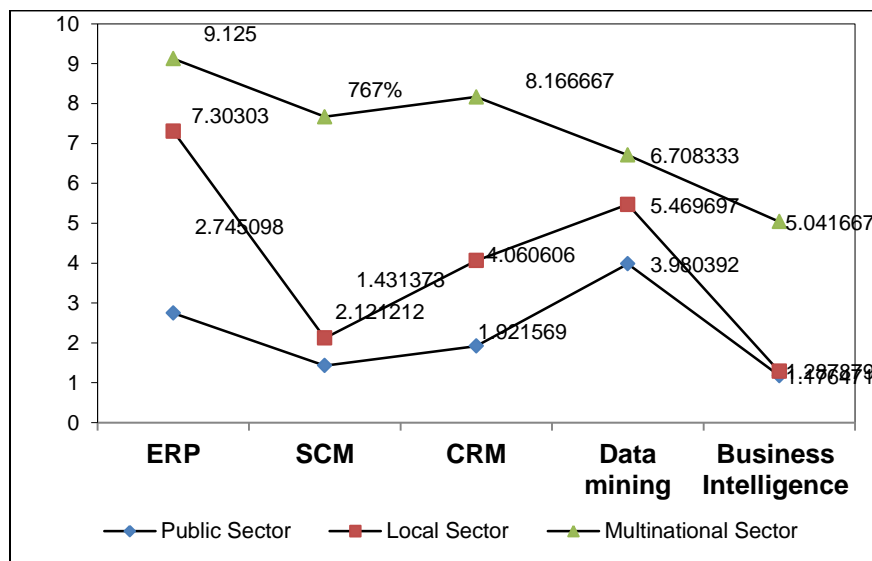


FIGURE 2
STRATEGIC INFORMATION SYSTEMS USAGE AMONG THE THREE SECTORS

Direct and Indirect Results of Testing Research Hypothesis

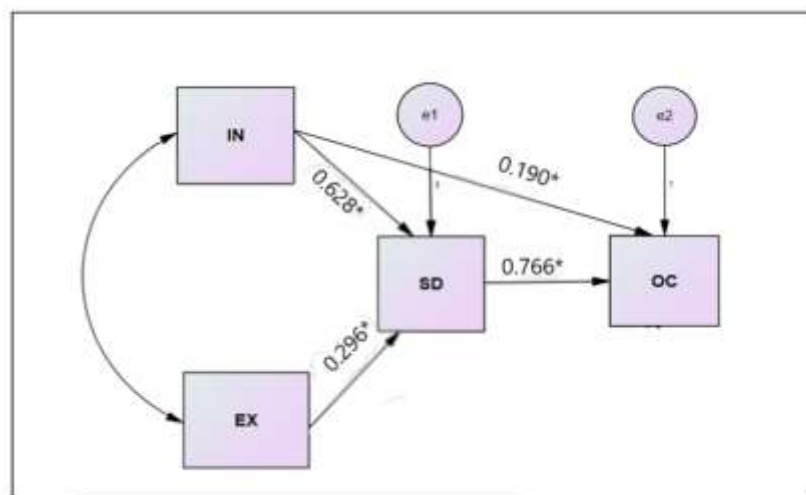
According to the approach suggested by Preacher & Hayes (2008), the direct relationships between research’s constructs have been examined followed by examining the indirect relationship between internally-focused Information System (IN) and externally-focused information system (EX) as two independent variables and Organization’s Competitiveness (OC) as a dependent variable through the Strategic Design (SD) as a mediator variable.

Path analysis was conducted to test the hypothesized relationships of the research variables within the causal structure of the model (Hair et al., 2010). A path diagram represents a set of structural equations called Structural Equations Modeling (SEM), as shown in Figure 3.

$$SD = b_1 IN + b_2 EX + E_1$$

$$OC = c_1 IN + c_2 EX + c_3 SD + E_2$$

The research model has been examined by using the AMOS/SPSS path analysis. The fit indices indicate satisfactory model fit for the proposed path analysis model: probability $P=0.651$; Ratio of Chi-square to degree of freedom=0.205, Goodness of Fit index (GFI)=0.999 and RMSEA=0.000.



**FIGURE 3
OBSERVED RESEARCH PATH DIAGRAM**

Results of examining direct path analysis relationship between research’s constructs

Hypothesis	Path	Regression coefficient (direct Effect)	Significant Level (p-value)	Empirical support
H_1	IN → SD	0.628**	0.000	Supported
H_2	EX → SD	0.296*	0.016	Supported
H_3	IN → OC	0.190*	0.028	Supported
H_4	EX → OC	NS	NS	Unsupported
H_5	SD → OC	0.766**	0.000	Supported

Note: ** $p < 0.001$, * $p < 0.05$ at a significant level 95%.

Consistent with H_1 , it has been found that Internal Information system capability is positively associated with strategic design (Colum 3 of Table 2: $IN \rightarrow SD=0.628$, $p\text{-value}=0.000$ i.e., highly significant). In H_2 , External Information system is positively associated with Strategic design (Colum 3 of Table 2: $EX \rightarrow SD=0.296$, $p\text{-value}=0.016$ i.e., significant). In H_3 , Internal Information system is positively associated with organization's competitiveness (Colum 3 of Table 2: $IN \rightarrow OC=0.190$, $p\text{-value}=0.028$ i.e., significant).

The Researcher also found support to H_5 , Strategic design positively associated with Organization's competitiveness (Colum 3 of Table 2: $SD \rightarrow OC=0.766$, $p\text{-value}=0.000$ i.e., highly significant).

Concerning H_4 ($EX \rightarrow OC$ Not significant), it has been found that external Information system capability not directly affect Organization's competitiveness, The researcher argues that such result of H_4 returns to the Egyptian organizational culture faces limited competitive intelligence sources and restricted external partnership, especially that 80% of sample represents public and local private sector.

Results of examining indirect path analysis relationship between research's constructs

The indirect effect of strategic IS capability on organization's competitiveness through affecting strategic design positively was examined using the Bootstrapping estimation approach and the results indicate that indirect coefficient is significant too.

Hypothesis	Path	Regression coefficient (Indirect Effect)	Significant Level (p-value)	Empirical support
H_6	$IN \rightarrow SD \rightarrow OC$	0.481**	0.001	Supported Partial Mediation
H_7	$EX \rightarrow SD \rightarrow OC$	0.227**	0.008	Supported Full Mediation

Note: ** $p < 0.001$, * $p < 0.05$ at a significant level 95%.

As shown in Table 3, consistent with H_6 , Internally- focused Information System (IS) capabilities positively associated with Organization's competitiveness through affecting strategic design positively (Colum 3 of Table 3: $IN \rightarrow SD \rightarrow OC=0.481$, $p\text{-value}=0.001$ i.e. highly significant). This shows that, the technical and business knowledge of information system staff and internal system collaboration that facilitate the flow of strategic information to reach the decision makers in right format and right time indirectly improves the quality of provided products and its variation through designing competitive strategies.

The researcher also found support to H_7 , Externally- focused Information System (IS) capabilities positively associated with Organization's competitiveness through affecting strategic design positively (Colum 3 of Table 3: $EX \rightarrow SD \rightarrow OC=0.227$, $p\text{-value}=0.008$ i.e. highly significant).

The results of indirect relationship between IS capability and organization's competitiveness support that Strategic/Information system alignment positively affect organization's competitiveness, i.e. the technology alone is not source of competition using it in designing competitive strategies build up sustainable competitive advantage for the organization.

Important conclusion: “*Information System/Strategic Design alignment positively affects organization’s competitiveness*”.

CONCLUSION AND RECOMMENDATIONS

According to the research objectives and hypothesis, it has been found that the extent to which strategic IS capabilities contribute in effectiveness and efficiency of strategic design process affect positively the organization’s competitiveness, through:

1. Acquiring, analyzing and disseminating real-time, precise, relevant strategic knowledge and competitive intelligence for decision makers.
2. Extracting, discovering and estimating strategic knowledge about external market environmental trends such as emerging opportunities and critical trends.
3. Clarifying and communicating the strategic vision, mission, objectives and strategies within and outside the organization.
4. Facilitate collaboration and involvement of internal and external stakeholders.

In addition, the research model has been proved to be useful in explaining the relationship or chain of events that leads to the final organization’s competitiveness based on the significant paths between “*Internal Information system capability*” and “*External Information system capability*” and “*Strategic Design*”.

Recommendations and Managerial Implication

There are different managerial implications and recommendations that could be derived from the findings of both qualitative and quantitative analysis besides the challenges faced by each sector.

Recommendations for leaders of pharmaceutical companies in public sector:

1. Conducting events, meetings and trainings for CEOs and senior managers in the computer and information technologies will eliminate the fear of such technologies, thus affording CEOs a better understanding of the potential benefits and limitations of information systems.
2. Motivating collaboration among the IT managers of the 11 Holdipharma companies through active regular meetings like policy meetings for companies CEOs for the purpose of exchanging experiences and working together on united IS strategies and plans.
3. Recruitment based on professional criteria in choosing among subordinates, especially the employee needed to be more IT qualified and qualified in business practices as well.
4. Motivating a collaborative and IT based organizational culture by which information is perceived to be an organizational resource rather than a personal asset.

Recommendations for leaders of pharmaceutical companies in local private sector:

1. Appropriate and careful package selection that copes with new technologies and the organization business strategies.
2. Motivating an organizational culture, in which IT staff and business functional employees are willing and rewarded to share their own business and IT knowledge with each other’s, is highly significant.
3. Establishing more professional IS/business relationships through building up business policies supported and motivated by Top managers.
4. Improving the IS Project team competence for both technology and business knowledge, can help them to propose appropriate applications and technologies on behalf of their organization business strategies.

Recommendations for leaders of pharmaceutical companies in MNCs sector:

1. Giving more attention for IS project management competences and technology transfer through appropriate gap analysis and customization techniques especially because the difference between the international and the Egyptian pharmaceutical business workflow.
2. IS Vendors' or Mother Company IS support through regular meetings and training for both Information System (IS) and business staff on the usability and knowledge of new technologies like cloud technology its importance and limitations.

Throughout all suggested recommendations for public, local private and MNCs, Both senior managers and Information technology executives can bridge the gap between their business and Information system knowledge for more collaboration, which can result in better IS/strategic alignment that will lead to sustainable competitive advantage for their organizations.

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