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# A unified strategic business and IT alignment model: A study in the public universities of Nicaragua

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## ABSTRACT

A number of attempts have been made to define the strategic business and IT alignment, several representations on what business and IT alignment are available in academic and practitioners field. The literature suggests that firms need to achieve the strategic alignment to be competitive firms. This article provides a prioritization of the components of a defined strategic business and IT alignment model. The strategic business and IT alignment model used in this study is termed the unified strategic business and IT alignment model and it is based on four well know strategic business and IT alignment models. The components of the unified strategic business and IT alignment model were ranked with a group of IT experts and business experts of four public universities in Nicaragua. The result can be used as a basis for improving strategic business and IT alignment.

## Keywords

Strategic alignment, public universities, AHP.

## INTRODUCTION

The annual survey on top management concerns by the Society for Information Management (SIM) ranked 'IT and business alignment' as the No. 1 concerns for four years in a row (Vargas et al; 2008). For two decades, strategic business and IT alignment (henceforth referred as strategic alignment) has consistently appeared as a top concern for IT practitioners and company executives (Luftman et al., 2005) and it has been constantly and repeatedly ranked as the most important issue facing corporations since the mid-1980s (Benbya and McKelvey, 2006).

Despite the importance of strategic alignment, most of the studies of strategic alignment identified in the literature were developed in the context of private institutions, although alignment is a concern not only for private institutions but also for public institutions. Many public universities of Nicaragua have invested in IT to achieve a better performance on educational processes and administrative processes. Many IT departments of public universities find themselves in a state of support service or cost centre to support some critical educational processes and administrative processes. Many decision makers of public universities of Nicaragua do not support their decisions based on previous studies of prioritization of the components of a strategic alignment model. It is therefore necessary for strategic alignment to be conducted in public universities.

In this article, we conduct a study of prioritization in four public universities in Nicaragua to identify the relative importance of the components of a strategic alignment model according to IT experts, IT directors and business managers. In order to

perform the study, a previously created strategic alignment model, termed the unified strategic alignment model, in conjunction with the analytic hierarchy process (AHP) were used.

This article unfolds as follows: In the next section, a description of the components of the unified strategic alignment model is presented; section 3, a brief description of the AHP is presented. Section 4, the methodology employed to do the prioritization of the unified strategic alignment model is presented. Section 5 shows the concluding remark. Finally, section 6 shows the limitation of this study.

## **UNIFIED STRATEGIC BUSINESS AND IT ALIGNMENT MODEL**

In a previous article, we constructed a unified strategic alignment model to provide a better understanding of the nature and key aspect of the strategic alignment from different, and sometimes complementary, theories. The process of construction of the unified strategic alignment model can be found in the article written by Vargas et al; 2008. The unified strategic alignment model is presented in the appendix of this article. The unified strategic alignment model is based on four strategic alignment models: Strategic Alignment Model (SAM), Strategic Alignment Maturity Model (SAMM), Strategic alignment model proposed by Yolande Chan, and research model proposed by François Bergeron. In this section, we give a description of the components of the unified strategic alignment model.

The unified strategic alignment model is composed by the dimensions: functional integration and strategic fit. The functional integration identifies two types of integration: strategic integration and operational integration. The strategic integration is the link between business strategy and IT strategy. Operational integration is the link between IT infrastructure and processes, and organizational infrastructure and processes.

### **Structure of the Business Strategy**

Business strategy is defined in terms of: business scope, business governance, and distinctive competencies. Business Scope refers to everything that might effect the business environment (Papp and Luftman, 1995). Business Scope includes the markets, products, services, groups of customers/clients, and locations where an enterprise competes as well as the competitors and potential competitors that affect the business environment (Henderson and Venkatraman, 1992, 1993).

Business Governance refers to the relationships that exist between the stakeholders of the company and senior management, mainly the board of director. This also includes any governmental regulations and relation between other strategic business partners (Henderson and Venkatraman, 1992, 1993). Distinctive Competencies refers to all the things that make the business a success in the market place (Papp and Luftman, 1995). This includes the critical core competencies that provide a firm with a potential competitive edge. This also includes brand, research, manufacturing and product development, cost and pricing structure, and sales and distribution channels (Henderson and Venkatraman 1992, 1993).

The business strategy includes components that constitute the operationalized level of it. These components are: understanding of business by IT, understanding of IT by business, inter/intra organizational learning/education, protocol rigidity, knowledge sharing liaison(s) effectiveness (Luftman et al; 1993, 1999; Luftman, 2000, 2003, and 2005), defensiveness, proactiveness, analysis, riskiness, aggressiveness, futurity (Bergeron et al; 2003; Chan and Huff, 1993; Chan et al., 1997; Hale and Cragg, 1996; Venkatraman, 1989).

### **Structure of the Information Technology Strategy**

IT strategy is defined in terms of: IT scope, systemic competencies, IT governance and communication. IT Scope is simply all of the essential information applications and technologies that the business uses (Papp and Luftman, 1995). Systemic competencies is all capabilities (e.g., access to information that is important to the creation/achievement of a company's strategies that set the IT services apart from the rest (Henderson and Venkatraman, 1992, 1993; Papp and Luftman, 1995). This involves how much access the business has to information that is important to business's strategy (Papp and Luftman, 1995). IT governance describes the makeup of the authority behind the IT and how the resources, risk and responsibility are distributed between the business partners, information technology management, and the service providers (Papp and Luftman, 1995). Communication use a common and clear language between business and IT organizations (Luftman et al; 1999; Luftman, 2000; Luftman, 2003)

The IT strategy includes components that constitute the operationalized level of it. These components are: prioritization processes, steering committee, IT investment management, budgetary control, IT strategic planning, reporting / organization structure, business strategic planning, traditional, enabler / driver external, standard articulation, understanding of business by IT, understanding of IT by business, inter / intra organizational learning, protocol rigidity, knowledge sharing, liaison breadth / effectiveness (Luftman et al; 1999; Luftman, 2000; 2003), environment scanning, strategic use of IT (Bergeron et al; 2003), aggressive IS, analytical IS, externally defensiveness IS, future oriented IS, proactive IS and innovative IS (Chan and Huff, 1993; Chan et al., 1997; Hale and Cragg, 1996).

### **Structure of the Organizational infrastructure and processes**

Organizational infrastructure and processes is defined in term of: administrative structure, processes, and skills. Administrative structure refers to how the organization runs its business (Papp and Luftman, 1995). This includes choices about organizational structure, roles, responsibilities, and reporting relationships (Henderson and Venkatraman, 1992, 1993). Processes refers to just that, all of the activities and how they operate. Concepts like value added activities and processes improvement apply here (Papp and Luftman, 1995). Skills indicate the choices about the capabilities of the individuals to execute the key tasks that support business strategy (Henderson and Venkatraman, 1992, 1993).

The Organizational Infrastructure and process includes components that constitute the operationalized level of it. These components are: Locus of power, management style, innovation entrepreneurship, social, political, trusting environment, education, cross-training, career crossover, change readiness, role of IT in strategic business planning, business perception of IT value, IT program management, business sponsor / champion, relationship / trust style, shared goals, risk, rewards / penalties (Luftman et al; 1999; Luftman, 2000; 2003), formalization, administrative intensity, professionalization, specialization, vertical differentiation (Bergeron et al; 2003).

### **Structure of the IT Infrastructure and processes**

IT Infrastructure and processes is defined in term of: architecture, processes and skills. The architecture, consisting of applications, data, and technology, “articulated in terms of the configurations of hardware, software, and communications” (Henderson and Venkatraman, 1992, 1993). Processes which include the works processes central to the operations of the IT infrastructure, including processes for systems development and maintenance as well as monitoring and control systems (Henderson and Venkatraman 1992, 1993). Skill which involves knowledge and capabilities required to effectively manage the IT infrastructure within the organization (Henderson and Venkatraman 1992, 1993).

The IT Infrastructure and process includes components that constitute the operationalized level of it. These components are: Formal assessments / review, service level agreement, balanced metrics, IT metrics, benchmarking, continuous improvement, business metrics, locus of power, management style, innovation entrepreneurship, social, political, trusting environment, education, cross-training, career crossover, change readiness, architectural transparency and architectural integration (Luftman et al; 1999; Luftman, 2000; 2003), IT planning and control, & IT acquisition and implementation (Bergeron et al; 2003).

### **ANALYTIC HIERARCHY PROCESS**

AHP is a multiple criteria decision-making tool (Vaidya and Kumar, 2006) that employs a pair-wise comparison procedure to arrive at a scale of preference among sets of alternatives (Saaty and Ramanujam, 1983). With AHP, the decision-maker carries out simple pair-wise judgments that are then used to develop overall priorities for ranking the alternatives (Saaty and Vargas, 2001). AHP is based on the eigenvalue method proposed by Saaty. Eigenvalue Method is the only valid method for deriving the priority vector from a pair-wise comparison matrix, particularly when the matrix is inconsistent. The eigenvalue method is necessary and sufficient to uniquely capture the ratio scale rank order inherent in inconsistent pair-wise comparison judgments. (Saaty and Hu, 1998).

The AHP involves the structuring of any complex problem into different hierarchy levels with a view to accomplish the state objectives of a problem (Bayazit, 2005; Saaty, 1990). A decision maker can insert or eliminate levels and elements as

necessary to clarify the task of setting priorities or to sharpen the focus on one or more parts of the system (Saaty, 1990). In figure 1, we show the hierarchy structure of the unified strategic alignment model.

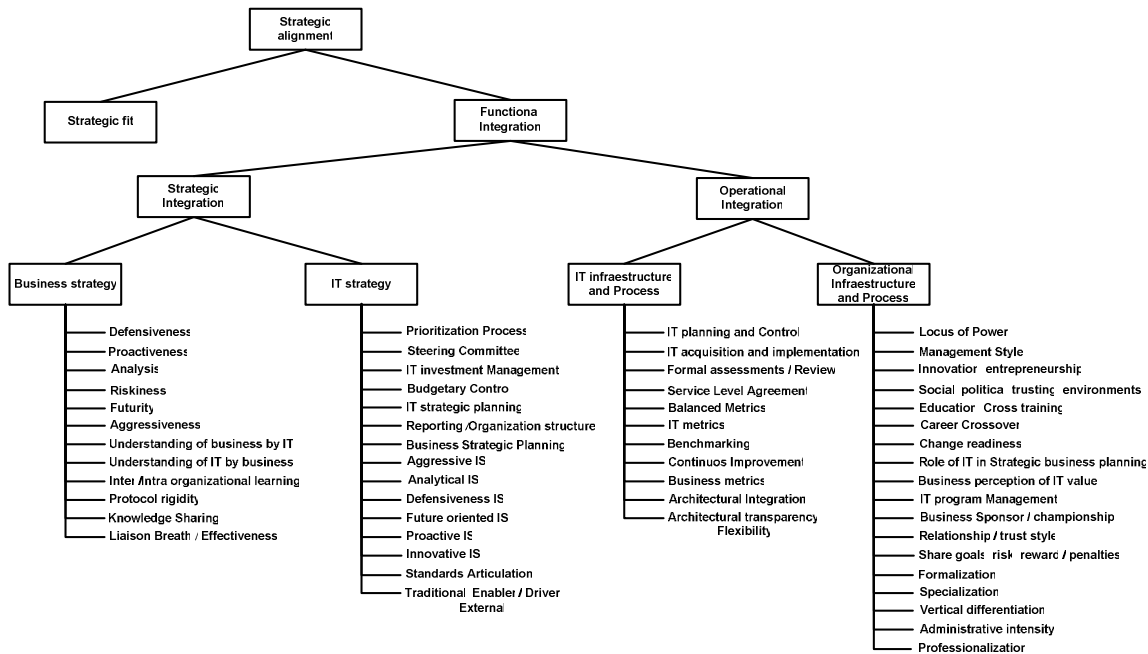


Figure 1. Hierarchy structure of the unified strategic alignment model

Saaty (1990) suggests that one of the uses of a hierarchical structure is that it allows judgment to be focused separately on each of several properties essential for making a sound decision. The most effective way to concentrate judgment is to take a pair of elements and compare them on a single property without concern for other properties or other elements.

In a typical AHP pair-wise comparison, matrices are prepared between alternatives with respect to each criterion being considered. Each entry in the matrix  $A = a_{ij}$  represents the strengths of preferences that the decision-maker believes exist for the alternative. There is an infinite number of ways to derive the vector of priorities from the matrix  $(a_{ij})$ , but emphasis on consistency leads to the eigenvalue formulation:

$$\lambda_{\max} w = Aw \text{ Equation (1)}$$

Where  $A$  is the matrix of pair-wise comparison,  $\lambda_{\max}$  is the principal eigenvalue of the comparison matrix and  $w$  is the vector of priority  $[w_1, w_2, w_3, \dots, w_n]$ . Thomas Saaty proposed a method known as averaging over normalized columns. “This method calculates the sum of the  $n$  columns in the comparison matrix. Next, divides each element in the matrix by the sum of the column the element is a member of, and calculate the sums of each row. Then it normalizes the sums of the rows”. (Karlsson and Ryan, 1997). The result of this method is referred to as the priority matrix and it is an estimation of the eigenvalues of the matrix.

The Analytic Hierarchy Process includes a consistency index (CI) for an entire hierarchy. In the equation 2, the CI of a matrix of comparison is given by Saaty and Vargas, 2001.

$$CI = (\lambda_{\max} - n) / (n - 1). \text{ Equation (2)}$$

The  $\lambda_{\max}$  is the principal eigenvalue of the comparison matrix. The closer the value of  $\lambda_{\max}$  is to  $n$ , the smaller the judgmental errors and thus the more consistent the result (Karlsson and Ryan, 1997). The consistency ratio (CR) defines the accuracy of the pair-wise comparison.

$$CR = \frac{CI}{RI} \text{ Equation (3)}$$

It is obtained by comparing the CI with the appropriate one of the following set of numbers (see table 1)

N	1	2	3	4	5	6	7	8	9	10
Random Consistency Index (R.I)	0	0	0.52	0.89	1.11	1.25	1.35	1.41	1.45	1.49

**Table 1. Average Random Consistency Index (R.I.) (Adopted from Saaty and Vargas, 2001).**

## METHODOLOGY

The methodologies for ranking the most relevance components of the unified strategic alignment model are based on survey results, where the preferences of specific groups are used as a basis for ranking. We have selected AHP method proposed by Thomas Saaty to do the ranking of the components of the unified strategic alignment model in the public universities in Nicaragua. The universities in Nicaragua are classified in: public university, private university and semi private university. In this study, we focus only in the public universities of Nicaragua. The public universities are four in Nicaragua. These four universities have shared a common vision and general objectives in the field of Information and Communication Technology (ICT) project since 2001 and they have invested strongly in IT. They are very similar in their governance. It means they are similar in their management, policies and processes. In the next section, we give more details about the conduction of the survey in the public universities of Nicaragua.

### Data collection

In August and September 2009, a survey was applied to 20 IT experts and business experts from Nicaragua, asking them to prioritize the components of the unified strategic alignment model. An e-mail was sent to the IT directors of four public universities of Nicaraguan to explain them the purpose of the survey and asking them time to do a presentation about the survey.

A presentation was done to 4 IT directors of the public universities under study. The presentation was based mainly on the purpose and the methodology adopted for survey. IT directors were promised that the information obtained from the survey would be handled with confidentiality. After the presentation, the names of the selected respondents were given by their IT directors according to the next criteria:

- The respondent should be a practitioner (IT expert, business manager and IT directors) with more than 5 years working in the field at the public universities in Nicaragua.
- The respondents should be involved in the annual planning of IT activities in their university.

We booked an appointment of two hours with the selected respondents by the IT Director and the protocol for the study was sent by e-mail to them with a week in advance prior to the personal interviewing. The protocol was made up of a glossary, a scale and the instrument. The glossary contains the description of the components of the unified strategic alignment model. The scale is the fundamental scale of the AHP. The instrument is based on the components at the lowest level of the unified strategic alignment model. The instrument for the survey consists of four matrices of comparisons: business strategy, IT strategy, IT infrastructure and processes, and organizational infrastructure and processes. One example of matrix is the table 2. The application of the prioritization procedure proceeds as follows: the components of the lowest level of the hierarchy structure of the unified strategic alignment model are compared among the components that belong to the same dimension to identify their relative importance. The respondents were asked to grade the relative importance between the components. The pair wise comparisons were entered in the matrices (see table 2).

	Architecture integration	Continuous improvement	Benchmarking	Business Metrics	IT metrics	Balance metric	Service Level Agreement	Formal Assessment
Architecture integration								
Continuous improvement								
Benchmarking								
Business Metrics								
IT metrics								
Balance metric								
Service Level Agreement								
Formal Assessment								

**Table 2 Matrix of IT Infrastructure and process**

The scale used for indicating the relative preference for one component over another is shown in table 3. This scale enables decision makers to incorporate experience and knowledge intuitively (Harker and Vargas, 1987) and indicates how many times more important or dominant one element is over another element with respect to the criterion or properly with respect to which they are compared (Saaty; 2008). This fundamental scale has been validated for effectiveness, not only in many applications by a number of people, but also through theoretical comparisons with a large number of other scales (Saaty, 1990; Saaty and Vargas, 2001).

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Very strong importance	An activity is strongly favored and its dominance demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed

**Table 3 Fundamental scale (Adopted from Saaty 1990)**

In total, 367 comparisons were done for each respondents and it took approximately 2 hours to each respondent to do the pairwise comparisons.

**Data Processing**

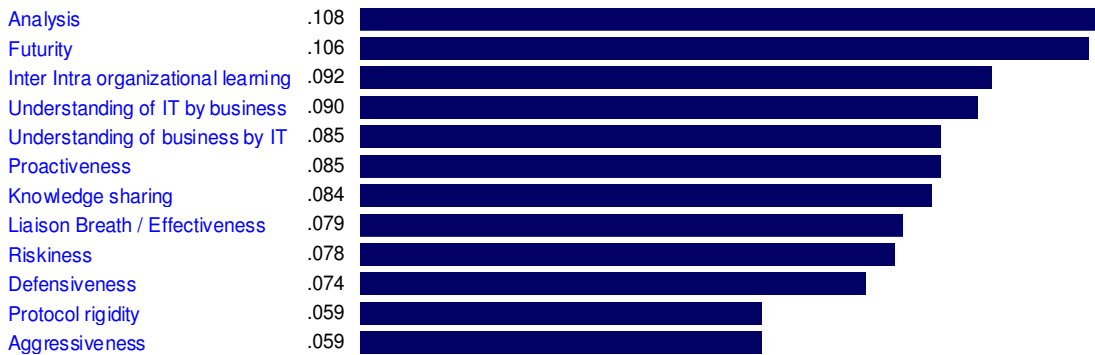
We used AHP to do the data processing of the data obtained in the survey. Saaty (1977) showed that the estimation of weight could be accomplished via an iterative computation (Zahedi, 1986). His computational algorithm is in the software Expert Choice. The software Expert Choice incorporates the AHP methodology and enables the analyst to structure the hierarchy and resolve the problem using relative or absolute measurements, as appropriate (Saaty and Vargas, 2001).

The data obtained from the respondents were processed using the software Expert Choice to weight the priorities of the components. Expert Choice is a decision support software that reduces complex decisions to a series of pair wise comparisons and then synthesizing the results (Oyku, 2005).

**Result**

The results of the ranking are sorted by priority and they are shown in the figure 2, 3, 4 and 5. The result of the ranking of the components of the unified strategic alignment model should be taken as reference by the decision makers to assist them to establish business strategy, IT strategy, organizational infrastructure and IT infrastructure. Decision makers should make more emphasis on the weightiest components over the least weighty components to assist them in the achievement of strategic alignment.

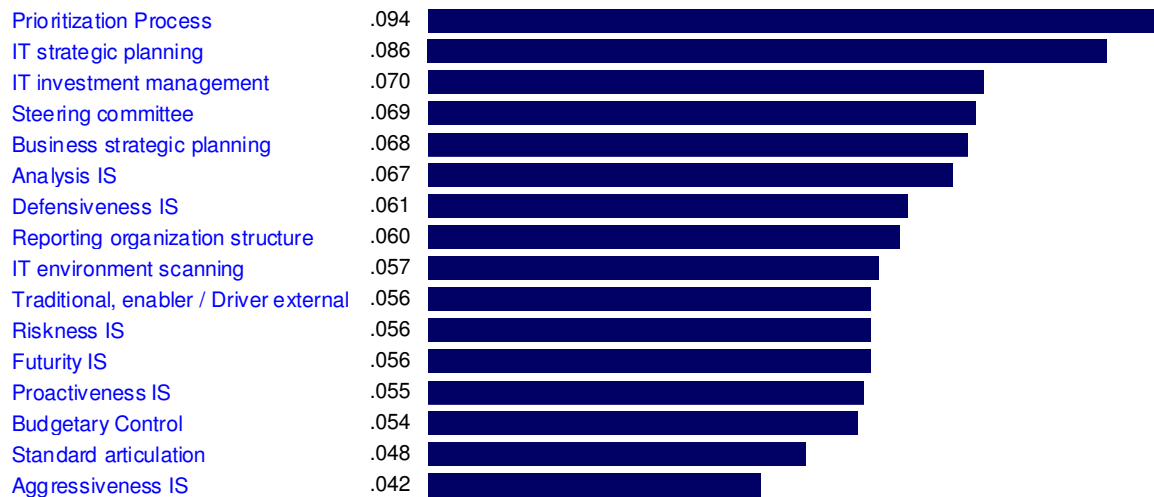
Figure 2 shows the results of the components that belong to the matrix business strategy. The weightiest component in the business strategy is analysis. It means that the decision makers should consider first the components analysis in the business strategy. Analysis of the business strategy in the public universities could be done through the SWOT (Strengths, Weaknesses, Opportunities, and Threats) tool. The second most important component is futurity. After considering the "analysis" components, the decision-makers should consider the "futurity" components in the business strategy of the public universities. The "futurity" components consider having a forward-looking, long-term focus. It means that all public universities should have a vision, mission and goal. The "analysis" and "futurity" components add up to 0.245 (25 percent) in weight of importance. The inconsistency of the result of the business strategy is 0.0087. The decision-makers should take into consideration this procedure of choosing the weightiest components over less weighty components in order to establish business strategy.



**Figure 2. Prioritization of business strategy**

The result of figure 3 corresponds to the IT strategy. The weightiest component in the IT strategy is prioritization process. This means that decision-makers should promote prioritization processes to make a more critical contribution in the IT strategy in the public universities. The second most important component is IT strategic planning. IT strategic planning is based on the goals of the firms and IT. This process defines the general direction regarding how to attain these goals via an IT strategic plan.





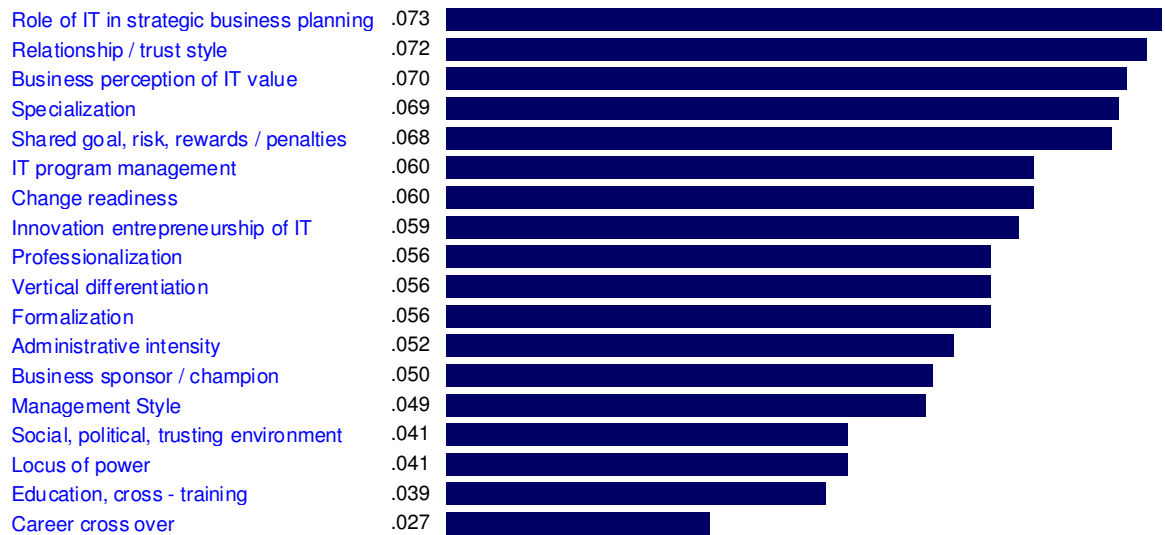
**Figure 3. Prioritization of IT strategy**

Figure 4 shows that the component "Continuous improvement" is the most important in the matrix IT infrastructure and processes. This result means that decision makers should promote more the audits in information technology and they should promote more the applications of standards in the public university as part of continuous improvement. The second most important component is "Architecture Integration". Architecture integration consists of applications, data and technology "articulated in terms of the configurations of hardware, software, and communications." It means that the public universities should continue working strongly on integrating those systems that are isolated and those that are not transparent to the staff (academic and administrative) and students (undergraduate and postgraduate). It is necessary to further monitor the implementation of integrated systems or networks. The "continuous improvement" and "Architecture integration" components add up to 0.31 (31 percent) of weight in importance to achieve a successful IT infrastructure and process in the four public universities in Nicaragua. The inconsistency of the result of the IT infrastructure and process is 0.02.



**Figure 4. Prioritization of the IT infrastructure and process**

The result of figure 5 corresponds to the organizational infrastructure and process. The weightiest component in the figure 5 is Role of IT in strategic business planning. It means that decision-makers should promote as a first priority the participation of the IT Directors in defining the business strategies. The second most important component is "Relationship/trust style." This means that relationship-building is critical for the success of a sound understanding and a sense of partnership between business and IT. Relationship also helps foster a better understanding of each other's point of view and helps change incorrect perceptions.



**Figure 5. Prioritization of organizational Infrastructure and process**

Figures 2, 3, 4 and 5 have showed that some components of the unified strategic alignment model are more relevant or critical than others in the four public universities of Nicaragua according to the decisions made by IT experts and business expert during the process of comparison among the components. The sort of importance from ascending to descending of the components of the unified strategic alignment model should be taken as reference by the decision makers of the four public universities because the sort of importance from ascending to descending can make possible to improve a successful business strategy, IT strategy, organizational infrastructure and process, IT infrastructure and process and these four components will impact positive in the strategic alignment in the public universities under study.

**CONCLUDING REMARK**

We used the analytical hierarchical process for the ranking of the components of the unified strategic alignment. We developed a hierarchy structure of the unified strategic alignment model in order to organize the unified strategic alignment model in a more simple way and increase the understanding about the unified strategic alignment model. The hierarchical representation of the unified strategic alignment model was used as reference to design the survey which was used in four public universities in Nicaragua. In this study, we identified that the components of the unified strategic alignment model are closer to the language used by the respondents in the public universities. It was therefore relatively easy to explain to the respondents the components of the unified strategic alignment model

The application of the unified strategic alignment does not include any measuring; rather the completeness and uniform structure of the unified strategic alignment model that it can support decision making process through the results obtained in the ranking. The result of the ranking of the components of the unified strategic alignment model has a positive effect because it can unify the opinion of a group of IT experts and business experts from different staff level that participated in the survey. The results obtained in this study should be taken as reference by the decision makers during the elaboration of the business strategy, IT strategy, organizational infrastructure and IT infrastructure in the four public universities to achieve a better strategic alignment. The prioritization process should be apply every time that decision makers elaborate the new business strategies and IT strategy.

## LIMITATION

We do not carry out an evaluation of the unified strategic alignment model in this article. Nevertheless, we show the applicability of the unified strategic alignment model through a survey in four public universities in Nicaragua. An evaluation of the unified strategic alignment model should be considered in a future research activity.

This study has the limitation that it is based on one method of prioritization. A method of prioritization according to the literature can be very useful for this study because we can develop a comparative study among both results.

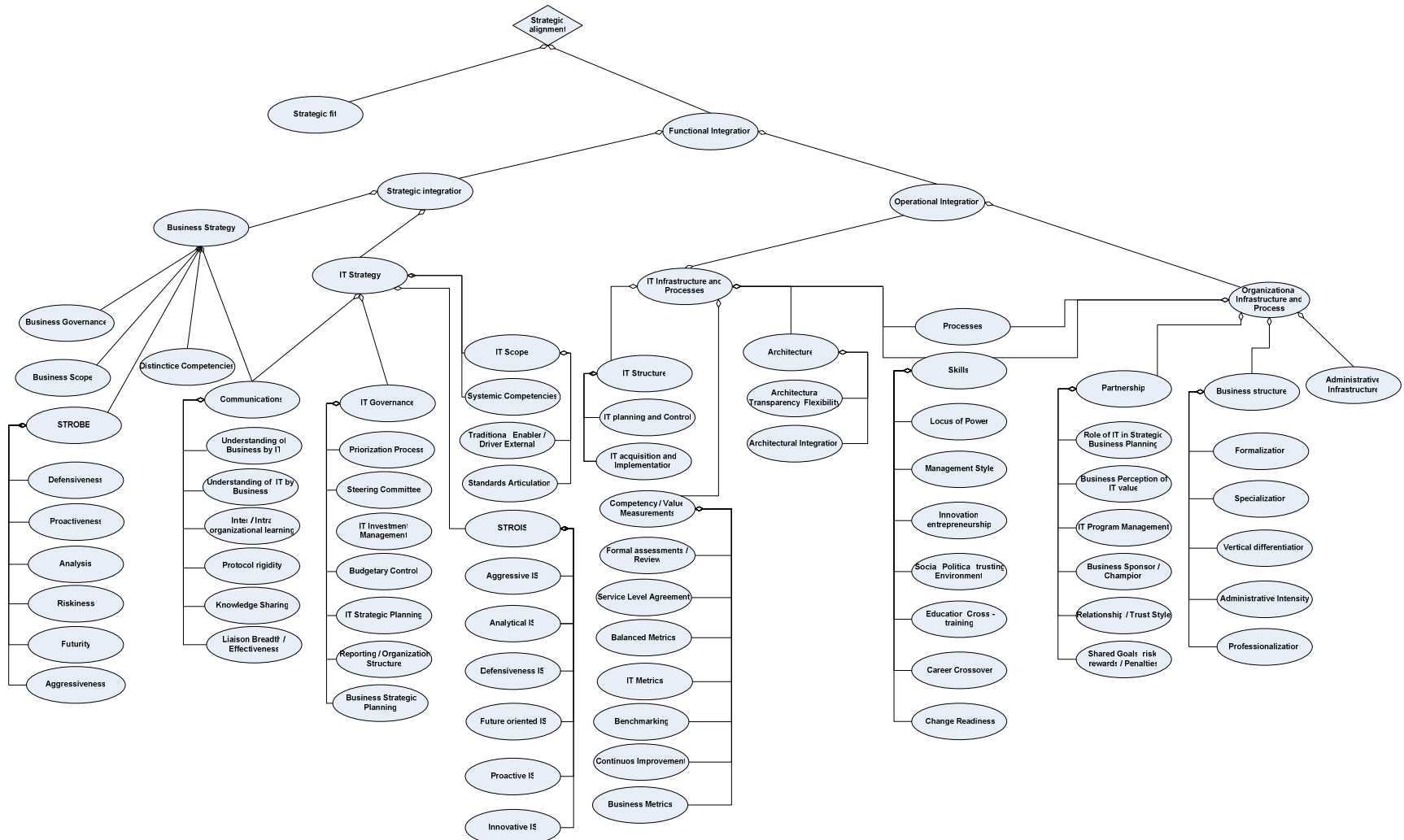
It has the limitation that the prioritization is based only in the public universities of Nicaragua. It will be good to include private universities and semi private universities to have a better picture of the ranking of the components of unified strategic business and IT alignment.

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APPENDIX



Unified strategic business and IT alignment model