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Evaluating the effectiveness of System Engineering on Organization Management Using Structural Equations Modeling

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Abstract

System Engineering, as a new implication and major, plays an outstanding role in the organizations. This system pays attention to the project beneficiaries, product designing, data architecture, customers' satisfaction, organizational integration, and applying organizational knowledge that has increased efficiency and productivity in an organization. Evaluating the effectiveness of system engineering on the organizational management targets (including product innovation, strategic planning) is considered to be one of the main issues engaged with the organizations. The purpose of this study is to evaluate the relation between system engineering, strategic planning, and product innovation engineering and to provide a comprehensive model for the execution of system engineering. For these purposes, specific processes have been identified for system engineering, strategic planning, and product innovation engineering. A questionnaire was prepared and distributed among the personnel at Iran Aircraft Manufacturing Co. Three assumptions were discussed (the influence of system engineering on strategic planning, the influence of system engineering on product innovation engineering, and the influence of strategic planning on product innovation engineering) and were evaluated by using of structural equations modeling (LISREL Software). The aforesaid influence was confirmed respectively with factor load of 5/10 and 2/84 *and 3/66.*

Keywords: *system engineering1, strategic planning 2, product innovation engineering3, structural equations modeling 4.*

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1 INTRODUCTION

System engineering is an inter-major implication that pays much attention to the quality of products, customers and beneficiaries' needs, cost savings, and the product lifecycle. We have to bear in mind that organizations face with fast changes and evolutions in the field of product designing and they plan and manage their activities in such a way to reach a competitive advantage in an agitated and competitive market. For this purpose, execution of system engineering is considered to be a suitable option for the creation of a systematic integrated organization in order to have multidimensional development, optimal organizing, better understanding of the environment, and effective planning for product designing. system engineering is one of the most powerful tools in project integrated management. Focusing on the project lifecycle, the aforesaid tool takes any individual activity into account. System engineering process is composed of management and engineering processes. Upon execution of the above system in the projects, major elements of a project i.e. cost, time, and quality can be controlled perfectly. The implication of system engineering as defined by International Council on System Engineering (INCOSE): "System engineering is an engineering major responsible for the creation and execution of an interdisciplinary approach in order to become sure that customers and investors' needs are met with a high and reliable quality, optimal cost, and timing conformed to the behavior of system lifecycle". In the above definition, creation and execution of a process is introduced as the "target". System engineering is responsible for the leadership and management in the engineering of large systems [1,2,3].

In addition, the organization requires product innovation in order to gain competition advantage. Learning organizations have to acquire innovation and creativity to reach success in their job. Innovation means painting in learning literature of an organization, introducing a new product, or changing the quality of existing product and applying new innovations process for the industry [4].

Likewise, strategic planning is required to search the opportunities and production process management. Strategic planning is a systematic method that supports and verifies the strategic management process. Strategic plans consist of all the actions leading to the defining of objects and determining suitable strategies in order to access those objects for the whole organization [5].

To consider the influence of system engineering in an organization, it is necessary to evaluate the aforesaid influence on the obligatory managements in the organization (i.e. strategic planning, product innovation engineering). Therefore, processes have been determined for each of these three models such a way that they would be able to cover these models completely. A questionnaire was prepared and the same was confirmed by Isfahan university professors (Management Department) and distributed among the personnel at Iran Aircraft Manufacturing Co. Afterwards, upon examination of reliability of the questionnaire by means of Cronbach's Alpha, we tried to evaluate the influence of system engineering on strategic planning and product innovation engineering by using structural equations modeling (LISREL Software) so that a final comprehensive model was provided for the execution of system engineering.

2 RESEARCH LITERATURE

System engineering activities have appeared during the first and second world wars. U.S Air Force was considered to be the first section that printed out the manual for system engineering. United States Department of Defense published MIL-STD-499 i.e. system engineering management in 1969 as the mechanism for standardization of system engineering management programs. In the mid-1980s, MIL-STD-499A introduced system engineering for practicing engineering management in the Department of Defense [6].

Of the main reasons of introducing system engineering as one of the most powerful tools in projects includes the multi-aspect examination and supervision in a project throughout its lifecycle. Another strong point is the treatment style in different project stages. That is to say

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system engineering has a very accurate and attractive approach towards project phases and it follows with review and control before starting any of the aforesaid phases. System engineering believes that perfect fulfillment of a project cannot compensate its weak design. Therefore, system engineering indicates that: upon more concentration on project design phases and act according to the instructions given by system engineering during these phases, it will be possible to prevent from repetitions and huge costs being imposed to the projects due to the weak design [6].

Customers' needs, conceptual design, risk analysis, performance analysis and architecture, physical architecture, design and manufacturing analysis, commercial studies and optimization, fabrication, validity test and approval, delivery, lifecycle costs, and management are the major specifications and features of system engineering [7]. The above features are put into 4 categories: parameters selection, requirements analysis, checking the alternatives, credit scoring, and verification of the alternatives [8].

Strategic planning enables an organization to respond to the procedures, occurrences, challenges, and opportunities through an insight and mission framework created by strategic planning. This type of planning intends to change the method of thinking and action by the organization and create a learning organization. As the result of such success, operation areas will be affected and form a major part of the philosophy and culture of that organization.

In fact, strategic planning process is one of the supportive processes for product design in an organization. This process consists of several sub-processes mainly as:

Visioning process; opportunities seeking process; capabilities analysis process; strategies recognition process; process of putting plans into operation; performance management process.

The above-mentioned processes integrate operative functions in the form of supporting systems in an organization (figure 1) [9].

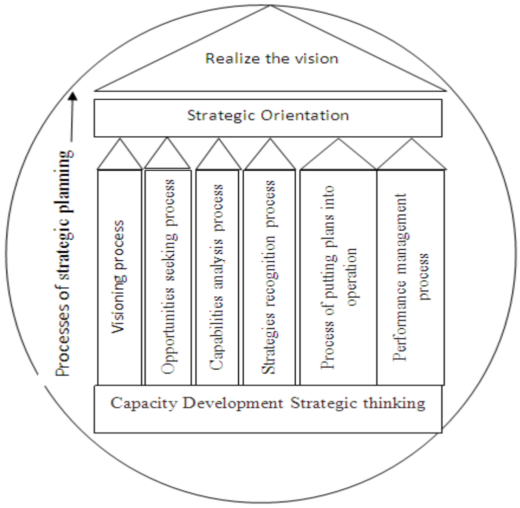

Figure 1: processes of strategic planning [9]

On the other hand, different models have been discussed for the selection and execution of strategy, for which we have provided a general comparison in the following table (table 1). This comparison enables us to apply these models in strategic planning in a better way.

Table (1): Advantages and disadvantages of strategic planning models

In the one hand, Innovation is mostly related to anything that may be called organized pushing aside. In fact, product innovation is an important aspect of a new product advantage. Also, systematic innovation consists of: "Looking for purposeful organized evolutions that may follow with economic and social innovations beside organized analysis of the opportunities;" In addition, if we wanted to create a new specific product, would we produce it exactly the same as it is? If no, please ask yourself what you would do at that time. In some cases, the answer is to simplify the job… In other cases, we have to stop the whole process and make fundamental changes [10]. Likewise, innovation consists of making a new product, services, or process [11].

In a research titled "product innovation engineering plan: use of the higher education students' ideas", have considered making a higher education systematic change towards innovation and entrepreneurship in the field of product innovation, complicated products, and medical technology by means of Product Innovation Engineering Plan (PIEp). PIEp consists of five universities/organizations in

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Sweden along with an international network with the intent to increase number of national and international partners. All the universities who participated in PIEp higher education provide activities and projects for the students at all stages including teachers and trainers. In addition, a base has been created in KTH University (the largest university in Sweden) for making systematic changes in effective engineering training towards innovation engineering and public entrepreneurship [12,13].

Three steps will be taken in product innovation design process: product innovation engineering (design new or optimized product), process innovation engineering (create or optimize a process), and sampling and testing. Product innovation engineering includes the followings:

✓ Design a product functionally, as like:
- Prepare printing paper (drawings, models, files …), prepare and design tools for fabrication
- Prepare specifications and standard books

✓ Design the product from the customer's point of view as like:
- Sales requisition, product appearance, and design a responding system to the customers' needs
- Perseverance and have hope towards life (design a product considering social and environmental attitudes)

✓ Design a product regarding cost aspects, as like:
- Lower and sufficient cost for market competitions, higher and sufficient costs in order to gain benefit
- Sufficient and correct cost in conformity with expected lifetime and endurance of the product

✓ Design a product concerning ease of repair, maintenance, and assembly, as like:
- Easy repair, maintenance, and application, feasible assembly and dis-assembly

3 RESEARCH METHOD

Taking into account the purpose of this study, we assume it is an applied research and data are collected through survey method. Structural equations modeling (SEM) was used for data analysis.

SEM is a very strong and general multivariate analysis method from multivariate regression family and more concise, it is a linear model that lets the researcher to test a set of regression equations simultaneously [14].

Statistical society included personnel at Iran Aircraft Manufacturing Co. The aforesaid statistical society consisted of around 480 persons. A questionnaire was prepared (no pre-made questionnaire was found related to the subject) and the validity was examined by the professors of Isfahan University (Management Department). Additionally, 12 senior designers considered that questionnaire regarding the concept and field of expertise. Finally, the same was distributed among 110 design staff and relevant reliability through Cronbach's Alpha was confirmed to 0/906.

The final questionnaire consisted of 56 questions for the measurement of fourteen processes (observed variables) and three models (latent variables). The sentences were narrative and of questions type. Likert Scale was selected for the alternatives from 1 (weak) to 5 (high).

Examination of the relationship between three models is done by SEM. These processes are provided in table 2.

Table (2): Introducing available Processes in research models

To start the analysis, we have to determine dependent and independent variables. Observed and latent variables have to be specified too.

a) Latent and observed variables

One of the most important decision making issues while using SEM is to distinguish between latent and observed variables. Observed variables are those actually being recorded in a sample (in fact, studied processes in this research are observed variables, as like vision process). On the other hand, latent variables are the assumed structures in a study such as strategic planning model, product innovation engineering, and system engineering.

In structural equations modeling, latent and observed variables in direction diagrams are

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shown with two separate symbols: Squares (rectangular) for the observed variables and ellipses (circles) for the latent ones. Observed variables are named in order (for example: X_1, X_2, X_3 …), which is placed in the center of each square or rectangular. Latent variables are displayed in short forms (Strategy, Innovation, and System) to be placed in the center of each circle or ellipse [15].

b) Dependent and independent variables

Dependent variables are those taking at least one route from other variables. Independent variables come from outside but do not take one route. Dependent and independent variables are also called exogenous and endogenous variables [15]. These are shown in figure 2.

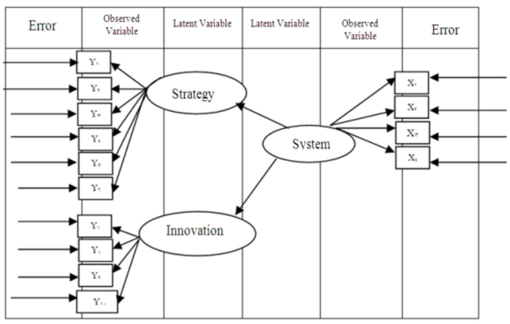

Figure 2: Existing parameters in SEM

4 RESEARCH FINDINGS

SEM method was applied for the analysis and examination of the relationships in conceptual model. In this study, two aspects of SEM i.e. measurement model and structural function model were applied. Measurement model of factor analysis is a kind of confirmation on the determination of partnership of any observed variables in the measurement of latent variable and structural model is related to the latent factors relationships. In addition, we have considered reliability and validity as the two complementary items in measurement model.

Structural model: Relationships between latent variables are taken into account (figure 3). This model includes research assumptions and the related results may lead to the acceptance or rejection of these assumptions. Two assumptions are discussed in this study as follows:

Assumption 1: System engineering has direct and positive influence on strategic planning.
Assumption 2: System engineering has direct and positive influence on product innovation engineering.

Assumption 3: strategic planning has direct and positive influence on product innovation engineering.

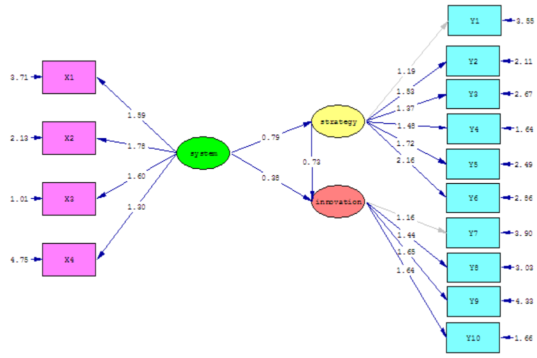

Figure 3: estimating of Structural modeling from influence of System engineering on Strategic Plan and product innovation engineering

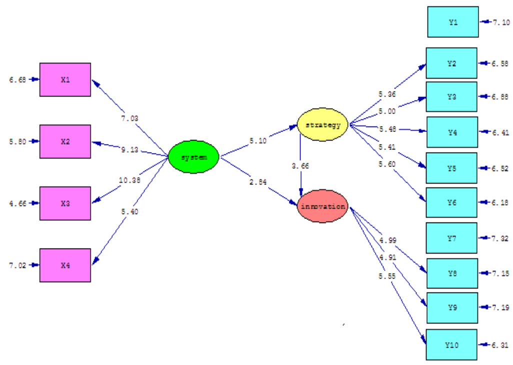

Figure 4: Structural modeling of T-Value from influence of System engineering on Strategic Plan and product innovation engineering

In figure 4, the values in parenthesis indicate the value of T-test. Those values bigger than 1/96 and smaller than -1/96 are meaningful and the assumptions are confirmed. Otherwise, the assumptions will be rejected. As per the final model taken from LISREL Software, all of the assumptions are confirmed.

Measurement model: The relationships between any factor and their relevant indicators are examined in this model. Table 3 provides the results out of measurement model and evaluation factors for the relation between factor and its indicators.

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Table (3): Analysis results for measurement model and partial evaluation factors

The percentage of determined standard variance, value of T-test, and standard factor load have been displayed in table 3 for the indicators of each factor. As the indicator of first factor from strategy and innovation is fixed to the value of 1, relevant T values have not been calculated and reported. Evaluation factor consists of the amount of relationship of each indicator with its infrastructural factor T value and its meaningfulness. Value of T more than 2 means a meaningfulness relationship between each indicator and its relevant factor. Therefore, it is concluded that all the indicators are related to their infrastructural factors meaningfully. To become sure about generality of the model and relationship, general fit indexes models provided in table 4 as follows.

Table (4): general fitting evaluation indexes for measurement model

Index	Value	Situation	Desirable
X^2	327/82		
Df	74		
P	0/00	Excellent	x<0.05
X^2/df	4/43	Excellent	1<x<5
IFI	0/88	Excellent	0/85<x<0/90
NNFI	0/85	Excellent	0/85<x<0/90
NFI	0/85	Excellent	0/85<x<0/90
CFI	0/85	Excellent	0/85<x<0/90

System engineering execution model: As the influence of system engineering on strategic planning and product innovation engineering has been confirmed, it is now possible to provide a model for its execution in an organization. For this purpose, we applied those processes discussed in earlier sections. Execution of strategic planning can be explained in six processes. On the other hand, product innovation engineering has four attitudes that requires innovation in the creation (or development) of the product. In addition, system engineering has four categorizations.

Synchronization of product innovation and strategic planning may help us to produce a product as per the customer's demand. However, we have enjoyed the benefits of all the capabilities inside the organization for any opportunities outside the organization. This fast reaction towards using the opportunities will make a competitive advantage in the organization. As such, besides keeping flexibility in the organization, we will be able to make a new product with exclusive specifications, which is considered to be the biggest competitive advantage.

If the above synchronization follows with system engineering, product requirements and its relevant analysis will be covered and will lead to the creation of a logical system in production considering the product requirements. Therefore, it is possible to examine the options and solutions for making a product and select the best one. For this purpose, we would be able to apply credit scoring and verification while running the strategy so as to become sure about suitable and correct performance in our organization towards making the product.

As the result, a model is going to be provided in this study that includes all the capabilities of these three models. As evident in the above figure, four product innovation engineering attitudes enter the system cycle. Customer's attitude can be understood from the house of quality, customer's voice, feedbacks after delivery of the product to the customer, comments evaluation etc. Performance attitude means the performance of that product (part) and its technical specifications that have to be examined concerning capability of the organization for production, assembly, parts fabrication (or purchasing). Cost attitude in product innovation means the organization's budget for production. It is necessary to mention that the best alternative for production is the suitability of cost and profiting with consumed time for design and production. In other words, time plays a fundamental role in design and to grab the competitors. We have to bear in mind that the best option has a suitable combination of accessible resources (including human resources, raw material and etc). The latest attitude is the ease of repair, maintenance, and assembly. For the product innovation, especially at the design stage, attention must be paid to the product maintenance, assembly of the parts, and repair. Ease of assembly, repair, and maintenance of the product may lead to the customers' attraction, better performance of the product, and increased sales rate (and grab the competitors).

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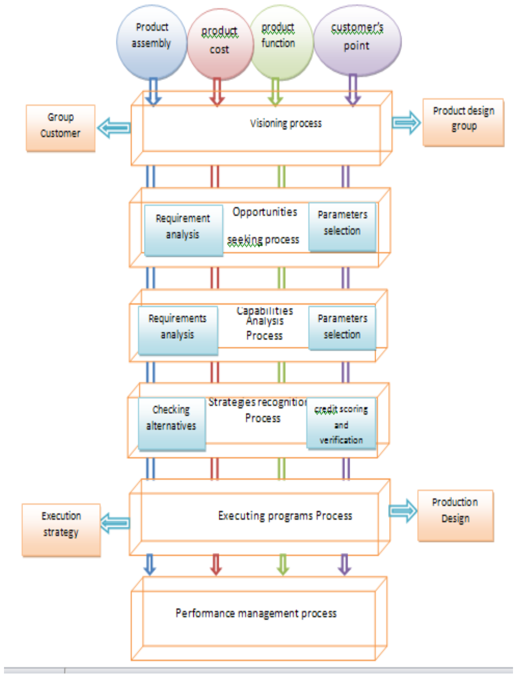

Figure 5: execution of strategic plan focus on product innovation engineering and system engineering

In figure 5, the first process in strategic planning is the vision tracing. Four product innovation attitudes enter the cycle and a vision is traced via these four attitudes for product designing. The aforesaid vision follows with two outcomes: Customer group and product design group. In fact, vision is determined for these two groups. Afterwards, the above four attitudes enter the next step (seeking opportunities) and it identifies the opportunities and classifies them into two groups (understanding the required parameters and requirements analysis). To search for the opportunities, we are able to apply CPM Matrix in order to select the best strategy. These will be repeated for the next step (analysis of the capabilities and abilities). However, this step will try in analysis of the capabilities and abilities to use the existing capabilities inside the organization (knowledge management) for product design and production. As such, we use SWOT Matrix and determine all the required strategies.

By means of SPACE Matrix, we prioritize all the pervious determined strategies and finally specify the main organizational strategies. For this purpose, it is possible to determine the main strategy and consider some substitutes for critical conditions. In the next step, plans must be put into operation that will lead to the execution of determined strategies and product designing. Finally, performance management will evaluate strategy execution and system performance by using David Model and prevent from deviations. This strategic planning will be established in the organization.

5 CONCLUSIONS

System engineering is an inter-major concept, capable of being executed in any project. However, it is more influential in big and complicated projects. Particularly, it has multi-aspect supervision throughout the project such that any weak points in design stage will be removed through running system engineering.

For this purpose, through using system engineering attitude, it is possible to design and produce a product in four categorizations orderly and systematically. This will cause better delivery of a product to the customer. Execution of strategic management in an organization not only creates a long term timing schedule, but also makes the organization to utilize existing circumstantial opportunities optimally. In this regard, capabilities and abilities of the organization are analyzed so as to enjoy the benefits of existing conditions in a perfect way.

As such, six processes were selected from strategic management so that organizations can identify internal and external opportunities and limitations and finally select the best strategy. On the other hand, product innovation engineering creates opportunities and capabilities by means of the aforesaid four attitudes, through which strategic management will be able to utilize opportunities and capabilities towards organizational targets.

Finally, a model was provided in the present study in order to execute system engineering along with strategic planning and product innovation and to apply all the three models towards organizational targets in an optimal way. To evaluate the influence of system engineering on strategic planning and product innovation, questions were prepared and a true questionnaire was provided. Validity of the same was examined by Isfahan University professors (Management Department) and it was distributed among the personnel. Two

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assumptions were discussed, the results of which are as follows:

1) The results indicated that system engineering with factor load of 0/79 has positive and direct influence on strategic planning. This assumption has been approved in T-test with the value of 5/10.
2) The results indicated that system engineering with factor load of 0/38 has positive and direct influence on product innovation engineering. This assumption has been approved in T-test with the value of 2/84.
3) The results indicated that strategic planning with factor load of 0/73 has positive and direct influence on product innovation engineering. This assumption has been approved in T-test with the value of 3/66.

It is suggested that organizations, besides taking action to seek and identify and enjoy the advantages of opportunities, evaluate their organizational capabilities through which they reach strategic goals and opportunities. In addition, suitable factors must be created to create relationships between suppliers (and customers), to guide and control these relationships and the staff have to cooperate in development and product optimization and submit their suggestions. For this purpose, their competencies, skills, and knowledge inside the organization (organizational knowledge) must be documented and applied for the works by the teams and groups.

REFERENCES

1. Hitchins, D. and Another; (2007), "Systems Engineering: A 21st Century Systems Methodology,".

2. INCOSE, (2006), "INCOSE Systems Engineering Handbook : A Guide frr System Life Cycle Process and Activities," .

3. Kasser, J. and Another; (2012), "Yes systems engineering, you are a discipline," in 22nd Annual International Symposium of the INCOSE, Rome, Italy, pp. 1-16.

4. Rogers, M.; (1998), "The definition and measurement of innovation: Melbourne Institute of AppliedEconomic and Social Research Parkville," VIC.

5. Omidvar, M; (2007), A summary of the strategic plan and model Bryson, Website development management services spring, http://www.bahar.co.ir, in Persian.

6. Faulconbridge, R. I. and Another; (2003), Managing Complex Technical Projects: A Systems Engineering Approach: Artech House.

7. Price, M. and Another; (2006), "An integrated systems engineering approach to aircraft design," Progress in Aerospace Sciences, vol. 42, pp. 331-376.

8. Kofigar, A.H; Googerdchian, M; Karbasian, M; Nilipoor, A; Khayambashi, B; (1391), Presentation a Executive model of Systems Engineering in Optimal Management of large and complex research projects in defense: Aviation Industries,9th International Conference on Industrial Engineering, University of Nasir al-Din Tusi, pp:1-16, in Persian.

9. Khatami, B; Mehdizadeh, H; (1387), Comparative study and evaluation of strategic planning models and provide a new framework for planning, 3th International Conference on Strategic Management, 7, pp 34-53, in Persian.

10. Cassia, L. and Another; (2012), "Strategic innovation and new product development in family firms: An empirically grounded theoretical framework," International Journal of Entrepreneurial Behavior & Research, vol. 18, pp. 198-232.

11. Pathak, R.and Another; (2015) "How Flexible is the Strategic Innovative Performance Target Design without Sacrificing Lead Time?," in Systemic Flexibility and Business Agility: Springer, pp. 235-247.

12. Grimheden, M.and Another; (2007), PIEp: Product Innovation Engineering Program," in Proceedings of the International Conference on Engineering Design, ICED.

Recebido: dia/mês/ano Aceito: dia/mês/ano

13. Grimheden, M. and Another; (2007), "Product Innovation Engineering Program: Utilizing Student Ideas in Higher Education,".

14. Masoudi, H; (1391), Teaching software Structural Equation, Mashhad, Ferdowsi University of Mashhad, in Persian.

15. Houman, H;(2005), Structural equation modeling using LISREL software, Tehran, Publishing OF Industrial Management Organization (SAMT Publishing), in Persian.

16. Ghazi tabatabaei, M; yousefi afrashteh, M; (2011), Analysis of the relationship between some of the variables associated with the evaluation of teaching by students: the application of structural equation modeling, Journal of Research and Planning in Higher Education, 64, pp:83-107, in Persian.

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6 APPENDIX

Table (1): Advantages and disadvantages of strategic planning models

Item	Model	Main features and characteristics	Advantages	Disadvantages
	Duncan Model	Including 5 steps (general model)	1- Execution interaction 2- Pay attention to evaluation and control 3- Pay attention to execution and performance 4- Pay attention to the codification of all aspects	-
David Model	A. CPM	Applied for prescribed or combined strategic planning	Introducing the competitors, competition powers, and their weak and strong points	Not suitable for exclusive conditions
David Model	B. SWOT	1- Maximization of applying weak and strong points 2- Minimization of bad effects of weak points and threats	1- Taking care of strong points and circumstantial opportunities and threats 2- Simplicity and clarity of the approach	1- Dependency upon personal opinions for strategy codification 2- Gain simple and non-documented results regarding figures and values
David Model	C. SPACE	1- Comparison of the company's power and competitors' ability to reach any of the defined targets 2- Consisting of vulnerability analysis matrix for the realization of company's success	1- The base for conclusion is quantitative and it is usable 2- Progressive dynamism in model approach 3- opportunities and threats, strong and weak points 4- Increase in the quality and accelerate decision making	1- Need comprehensive and complete information on the competitors 2- Large amount of required data 3- Limited outgoing variables in the model
David Model	QSPM	Comprehensive planning model	Good arrangement between mission, internal, and external factors towards long and short term targets, strategies and policies	1- There is no creativity and innovation in codification and it is linear 2- There is no flexibility and forecasting the future 3- Decisions are made based upon evident data

Table (2): Introducing available Processes in research models

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system engineering	strategic planning	product innovation engineering
parameters selection	Visioning process	Design of product functionally
requirements analysis	opportunities seeking process	Design the product from the customer's point of view
checking the alternatives	capabilities analysis process	Design of product regarding cost aspects
credit scoring and verification of the alternatives	strategies recognition process	Design of product concerning ease of repair, maintenance, and assembly
	Executing programs Process	
	performance management process	

Table (3): Analysis results for measurement model and partial evaluation factors

Variable	symbol	R^2	Value of T-test	Standard factor load
Visioning process	Y_1	0/53	-	1/19
Opportunities seeking process	Y_2	0/72	5/36	1/53
Capabilities analysis process	Y_3	0/64	5/00	1/37
Strategies recognition process	Y_4	0/76	5/48	1/48
Executing programs Process	Y_5	0/74	5/41	1/72
Performance management process	Y_6	0/79	5/60	2/16
Design a product functionally	Y_7	0/51	-	1/16
Design the product from the customer's point of view	Y_8	0/64	4/99	1/44
Design of product regarding cost aspects	Y_9	0/62	4.91	1/65
Design of product concerning ease of repair, maintenance, and assemblly	Y_{10}	0/79	5/55	1/64
Parameters selection	X_1	0/64	7/03	1/59
Requirements analysis	X_2	0/77	9/13	1/78
Checking the alternative	X_3	0/85	10/38	1/60
Credit scoring and verification of the alternatives	X_4	0/51	5/40	1/30

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