

Providing Effective Improvement Projects by European Foundation of Quality Management, Excellence Mode

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Abstract: Surveying casual relationship among EFQM excellence model sub criteria could be a great help for managers to develop and explain improve routs in order to develop strategies so that they could provide the best road map. The main goal of this research is to identify causal relationships among sub criteria emphasising on human resources. Human resource is the most effective factor in operation of companies and Automotive industry of Iran. To improve the key results of operation, the causal direction must be known in EFQM business excellence model. This job has done in 2001 by Eskildsen. The main problem of Eskildsen's research is that he just identified the causal relationships between criteria while to define improvement projects causal relationships among sub criteria must be studied. After conceptual models explained and hypotheses of the research defined, data related to latent and observed variables were collected through a questionnaire survey including 450 experts in Director excellence and evaluators of Excellence Award in the automotive industry in Iran. For data analysis, we use a powerful technique like structural equation models. Research results and various goodness of fit indicators showed that the model has been fitted well.

Key word: Business Excellence Model, Casualty Relationship, Human Resources Sub criteria, Structural Equation Modeling.

INTRODUCTION

Nowadays, using self-assessment for the survival of organizations and keeping the position of competition and understanding the strong points and the opportunities to improve them as an approach is ineluctable.

Meanwhile, the business excellence model EFQM has been quickly expanded as an organic self-assessment frame in many European companies since it has been introduced in 1992 and has been known as the most crowded tool of self-assessment (Hakes 1997). The main goal of European quality prize is to promote the awareness level of organizations and their attentions to the importance of quality in the universal competitive markets (Evans & Lindsey 2005) and for them to get to the business excellence via continuous improvement and running it in processes (Andersen *et. al.* 2003). In the primitive model of EFQM, the domestic cause and effect relationships between enabler criteria and also relationships between the enabler criteria and results criteria has not been identified. In 2000, a cause and effect model between enablers and the results of employees was represented by Eskildsen and Dalgard and followed by it, in 2001, Eskildsen and Kristensen gave a general and complete model for the cause and effect relationships in EFQM business excellence model criteria. Although organizations are not in doubt in using the EFQM excellence model at all there are some uncertainties about the model's domestic solidarity and specially the cause and effect relationships between criteria in academic studies (Bou & Liusar 2003) and the lack of knowledge about the relationships between EFQM model criteria has faced self-assessment with some problems (Eskildsen 2001). Unfortunately researchers have forgotten the basic principles of EFQM model in the recent years and most researches have been limited to operation evaluating phenomenon (Dong Young 2009). In a general study of the subjects of articles about EFQM by Young Kim the necessity of study about the cause and effect relationships between the model's criteria has been expressed clearly. This article is done with an emphasis on the previous articles of Eskildsen but the main goal of the explanation of cause and effect relationships between EFQM business excellence model sub criteria is from the people' criteria direction towards the key results. First we have given the propositional theoretical model and then we have evaluated this hypothetical structure with the collected data

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from among more than 195 value chain maker companies of Iran's Automotive industry and while the main goal is the explanation of the cause and effect relationships the best technique is using structural equations and LISREL software (Joreskog & Wold 1982).

In other parts of the article expressing the problem and how to explain it will be represented first. Then, the research's theoretical frame and how to explain the conceptual model will be described. After that, hypotheses of the research and followed by it, the research's methodology will be represented. At the end, the conclusions of the research and the proposals will be given.

Problem Setting:

Nowadays, most organizations have comprehended that the most powerful tool to attract attentions and consents of investors, customers, employees and society is to promote quality (Sadeh Arumugam 2010). The business excellence mode (EFQM) principles have continuously focused on improving results and its goal is to create suitable conditions and work environment and likewise giving better services to customers in the aspect of quality (Saizarbitoria. I. H. 2006).

Although it is necessary to design a model with its special characteristics with attendance to Iran's preferences and cultural, economical and social conditions the structure of one of the plussage models can be kept. But with regard to some reasons as the amount of Iran's business with Europe, existence of political problems in relationships with America, the possibility of holding EFQM training period, absence of enough documentations for Deming's model and limitation of user countries (Taiwan, Malaysia, Singapore) (D. Kim ,V. Kumar ,S. A. Murphy;2009), different lengths of the countries use EFQM model in industrial point of view, and the possibility of sampling, and the fact that this model has been designed on the basis of ensuring people's consent and not just for earning profit (Moller & Sontagi;2001) It seems that EFQM model is a proper pattern for being plussage in Iran. Meanwhile, Iran's Automotive industry has chosen European business excellence model as its plussage model to improve day by day and to access to universal markets by sampling from paramount companies and performs the annual self-assessment on its basis and needs in changing in the processes and the related elements to change its present status to higher status.

In this industry, the projects of improvement are designed based on the excellence prize evaluators' reports and considering criteria which require improvement. These projects are designed without considering the causal relationships between criteria and are represented to related company. In addition, the preference of performing the projects of improvement is not identified because of nonexistence of causal relationships. And at last, the probability of accessing to the considered logical result will be lower than the expected extent. Since Automotive industry of Iran is a functional industry, the role and importance of human resource is so vital in it. Human resource is the most essential effective factor on the operation of companies and Iran's Automotive. To improve the key results of operation the causal direction must be known in EFQM business excellence model. This job is done in 2001 by Eskildsen. The main problem of Eskildsen's research is that he identified just the causal relationships between criteria while to define improvement projects causal relationships between sub criteria must be studied.

Now the Main Question of the Research Is That:

How can the causal relationships between business excellence model's sub criteria by the emphasis on human resources criterion in the direction of influencing on key results criterion of operation be expressed?

And after That, the Following Question Comes Up:

If directions to give preference to the improvement projects in value chain maker of Iran's Automotive industry can be identified?

In fact, in this research it is tried to eliminate the deficiency of Eskildsen's model and causal relationships between sub criteria of this model are discussed with a deeper attitude to latent variables of EFQM model.

Research Framework:

The EFQM model consists of 9 major criteria which 5 of them are enabler criteria and the other 4 ones are results criteria. The main hypotheses of the model is that accessing to excellent efficiency is only possible via these 5 enable criteria (leadership, people, processes, partnership and strategy) (Dong Kim 2010). In fact, the enablers express from what way the organization can move to attract consent of stockholders and beneficiary groups and access to high quality and efficiency? (Bou- Liusar;2003).

What is assumptive and important here is the relationship between enablers and results criteria because companies must consider the relationships between criteria enablers and results in their evaluation for accessing

and keeping competitive advantage. As the whole score of the model is 1000, these scores are divided in to enablers and results proportionally 50-50 as it has been indicated in figure1(Kumar and Murphy;2010).

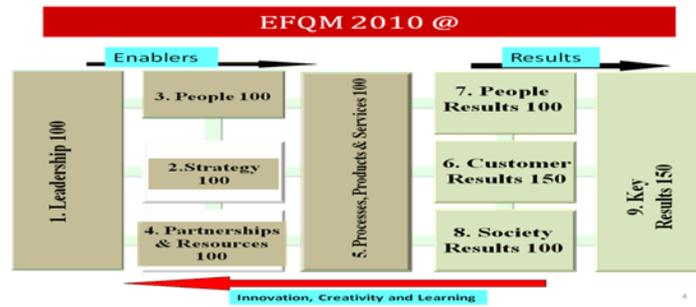


Fig. 1: The score division in EFQM model based on 2010 edition.

For this reason, low score in one of the enablers or results must attract company's to the point that what criteria and from which directions have affected this criteria to proceed completely and with consideration to the whole causal relationships between these criteria to identify improvable areas and opportunities too.

In this field, Eskildsen offered and expressed the theoretical model in figure 2 by assimilating patterns like Hakman and Oldham's work design model and customer's consent model from economical point of view (Fronel;1996) and ESCI model, too (Kristensen; 1999).

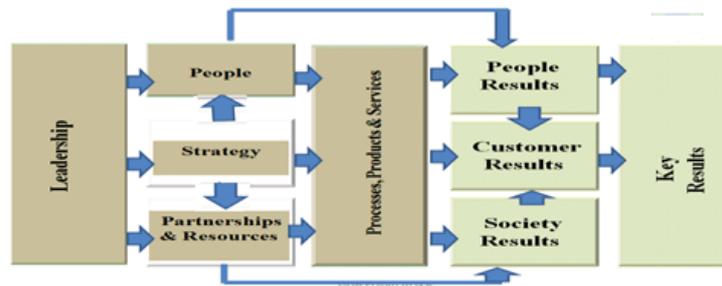


Fig. 2: Eskildsen's causal model.

Since each of these criteria are as a latent variable inside which consist of several sub criteria and are assessed by these sub criteria, so, identifying the causal relationships between the model's sub criteria will also be important as well.

In this case, as an example 3b sub criteria (developing employee's knowledge and competence) and 3d sub criteria (people communicate effectively through out organization) both influence directly on the envolving people and empowering, 3C. This claim has been expressed with emphasis on empowering model of (Bowen & Lawier. 1999) in figure 3.

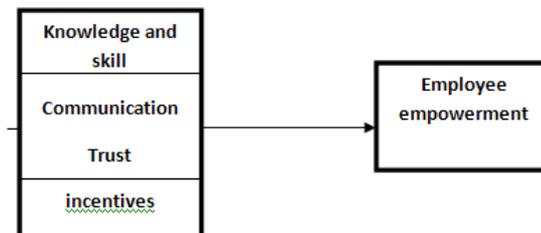


Fig. 3: Empowering model.

Indeed, it has been predicted that these 4 elements more influence on the group of employees who are in direct relationship with customers (Thamizhmani;2010). Companies give great importance to their customers and specially since customers have extended choosing right today, giving proper services to attract their consent and to keep them is one of the important operations of the companies. According to figure 4 (Russel. S. Winner. 2001).

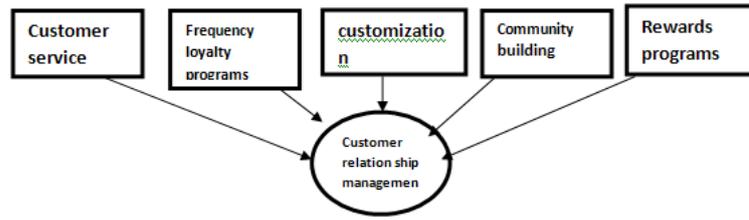


Fig. 4: Customer relation ship diagram.

it can be concluded that 5d sub criterion (delivering service and product and supporting it) influences directly on 5e sub criterion (enhancing relationship with customer).

In the other hand, since satisfied employees have better performance than dissatisfied ones and employees' satisfaction is one of measurement variables of peoples' perception results sub criterion, therefore, 7a have direct effect on 9a (Eskildsen; 2001).

A theoretic pattern in governmental organization is offered in figure 5 with which regard the knowledge development variable that is of the factors of empowering employees, the 3c sub criterion, has a direct effect on employees' operation, the 7a sub criterion and on the other hand, this 3c sub criterion also influences directly on giving services which is 5d sub criterion (Zawayah, Yusof; 2009).

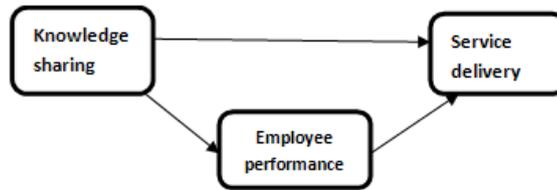


Fig. 5: The proposed theoretical frame work in governmental organization.

The benefit giving comes from 9a sub criterion as key results and customers' loyalty, the part of customers' results sub criterion, 6a, bodes on the matter that there must be a causal relationship between these two sub criterion because customers' loyalty is affected by their consent and complaint and the mutual relationship between customers' consent and financial consequences has been proved by Kristensen in 1997 so it can be concluded that customers' perception results influences on key results(Eskildsen & Kristensen; 2001).

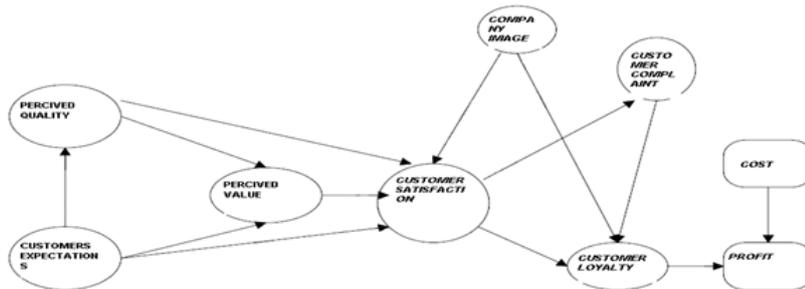


Fig. 6: Customer Satisfaction Model in an Economic Perspective.

In key consequences of operation one of the nonfinancial consequences is the time of product offer and the other is plentifulness or amount of products and services (EFQM; 2010). So it can be concluded that service and product delivering and supporting it, the 5d sub criterion, is directly related to key consequences of operation, 9a. From one hand, promoting relationship with customer sub criterion, 5e influences on customer's consent and loyalty in figure 6 which both are of customers' perception results so, 5e sub criterion influences on 6a sub criterion.

According to figure 6 (Fornell; 1996) it can be claimed that the two sub criteria of 5d and 5c of product planning at customers' requirement and service and product delivering to customers are related to receiving quality and meeting customer's expectation which both influence directly on customer's consent that customer's perception results sub criterion 6a infolds it.

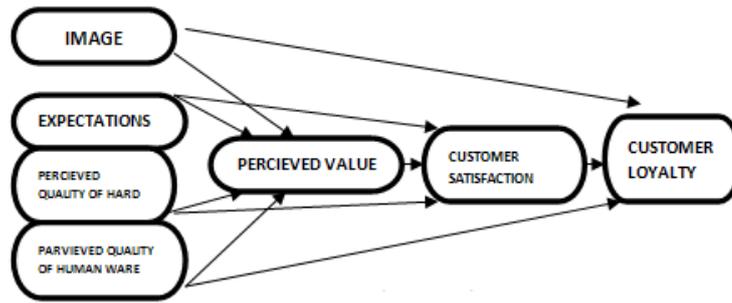


Fig. 7: The ESCI Model.

According to the diagram of figure 7 which is understood from human resources, also infolds customer's consent and loyalty. This element consists of all individual behaviors which customers feel at the time of being present at the organization's environment with employees (Kristensen; 1999) that this fact indirectly affects customers' perception results by means of peoples' criteria in business excellence model of EFQM directly. This proposal relationship has been confirmed by other studies, too (Kristensen & John; 1999).

In fact this includes only the criteria of employees, processes, employees' results, society's results and key results and it has been considered in results criteria, perception results and key consequences. And considering Eskildsen's casualty model we have considered just an illustrated part in figure 8.

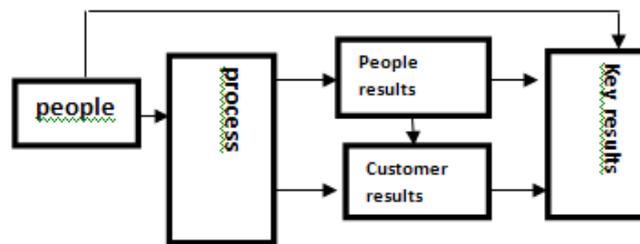


Fig. 8: Eskildsen's casualty model.

And finally, planning sub criterion and managing employees, 3a also influences on developing people's knowledge and competence, 3b, and creating a proper or improper point of view for employees in regard of organization, 7a, and also on product planning at customers' requirement, 5c. Now, paying attention to the above assumptions, we suggest the theoretical model in figure9.

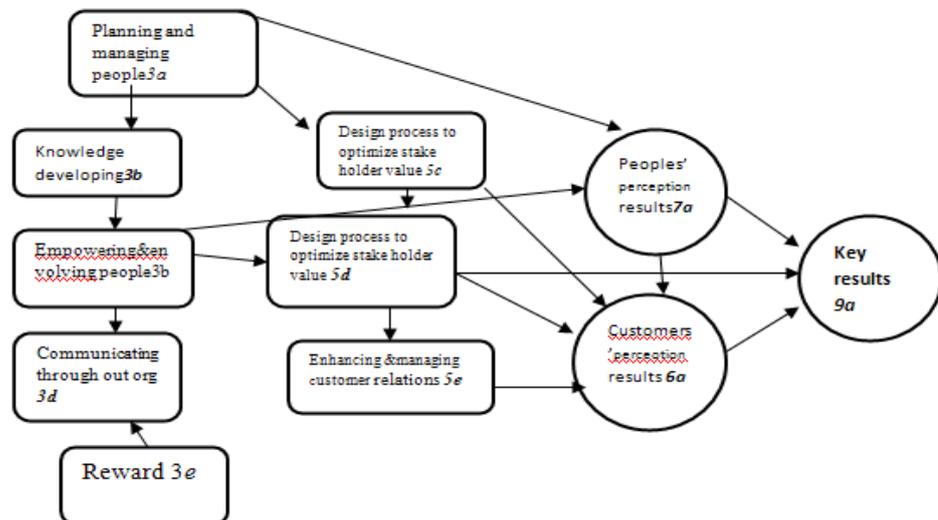


Fig. 9: The suggested causal relationships among the sub criteria in EFQM Excellence Model.

Hypotheses of Research:

According to the drawn sub criterion model in figure 8, we express the hypotheses of research as follows:

- H1: There is a significant relationship between planning and managing employees sub criterion and the illation index of employees' results.
- H2: There is a significant relationship between planning and managing employees sub criterion and product planning and expanding at customers' requirement.
- H3: There is a significant relationship between planning and managing employees sub criterion and developing employee's knowledge and competence.
- H4: There is a significant relationship between employees' knowledge and competence sub criterion and communion and enabling employees.
- H5: There is a significant relationship between communion and enabling employees sub criterion and employees' perception results.
- H6: There is a significant relationship between communion and enabling employees sub criterion and service and product delivering and supporting it.
- H7: There is a significant relationship between mutual relationship between employees and organization sub criterion and communion and enabling employees.
- H8: There is a significant relationship between the sub criterion of paying attention to employees and appreciating them and mutual speaking between employees and organization.
- H9: There is a significant relationship between product planning and expanding sub criterion and the illation index of customers' results.
- H10: There is a significant relationship between product planning and expanding sub criterion and service and product delivering and supporting it.
- H11: There is a significant relationship between the sub criterion of delivering services and product and supporting it and key results of operation.
- H12: There is a significant relationship between the sub criterion of delivering services and product and supporting it and the illation index of employees.
- H13: There is a significant relationship between the sub criterion of delivering services and product and supporting it and promoting relationship with customer.
- H14: There is a significant relationship between promoting relationship with customer sub criterion and the illation index of customers' results.
- H15: There is a significant relationship between the illation index of employees' results sub criterion and the illation index of customers' results.
- H16: There is a significant relationship between the illation index of employees' results sub criterion and key results of operation.
- H17: There is a significant relationship between the illation index of customers' results sub criterion and key results of operation.

Methodology:

This research has been done on Iran's Automotive industry. The statistical universe of the research are Automotive manufacturer companies, major ensurers of components, component manufacturer companies, engineering services companies and business companies all of which are in value chain makers of Automotive industry. From among companies which are under evaluation, 450 companies that have been evaluated by evaluator teams were chosen. The scores of evaluation for sub criteria and criteria were identified after consensus of evaluations.

Since this research is in field of expressing and describing, the Structural model and LISREL are considered as the proper approach. Because firstly these models are able to study and evaluate theoretical causal relationships that are predicted in the variables of the research, and secondly, LISREL software can exactly and quickly estimate the parameters of such models and evaluate the value of manufactured models. This modeling approach consist of two parts(Bollen;1992),the structural model and the measurement model, as shown in the formula:

Structural Model:

$$\eta = B \eta + [\xi + \zeta$$

Measurement Model:

$$X = \Lambda_x \xi + \delta$$

$$Y = \Lambda_y \eta + \varepsilon$$

(ξ_i) are the latent exogenous variables and in this analysis "plan" and "reward" are latent exogenous variables. (ξ_1, ξ_2).

(η_i) are the latent endogenous variables. in this case we have 9 sub criteria from the EFQM excellence model:

η^1 : "people's knowledge and capabilities are developed"

η^2 : "people are evolved and empowered"

η^3 : "people communicate effectively through out organization"

η^4 : "process are designed to optimize stake holder value"

η^5 : products and services are produced, delivered and managed.

η^6 : costumer relation ships are managed and enhanced.

η^7 : people perception results.

η^8 : customer perception results

η^9 : key results.

[γ]: is the associated coefficients for ξ

B: is the associated coefficient for η

And the last part of the structural equation is the error term ζ .

In the measurement model y represents the manifest variables for η and Λ_y the associated coefficients. in this analysis there are 27 y variables of ξ . x represents the manifest variables for ξ and Λ_x the associated coefficients. In this analysis there are 6 x variables.

There are 2 error terms δ and ε in this equation and they are the error of measurement for x and y respectively (Bollen 1989).

Structural Equations:

$$\eta_1 = \gamma^3 (\xi_1) + \zeta_1$$

$$\eta_2 = \beta_1 (\eta_1) + \beta_4 (\eta_4) + \zeta_2$$

$$\eta_3 = \gamma^4 (\xi_2) + \zeta_3$$

$$\eta_4 = \gamma^2 (\xi_1) + \zeta_4$$

$$\eta_5 = \beta_6 (\eta_4) + \beta_2 (\eta_2) + \zeta_5$$

$$\eta_6 = \beta_8 (\eta_5) + \zeta_6$$

$$\eta_7 = \gamma_1 (\xi_1) + \beta_3 (\eta_2) + \zeta_7$$

$$\eta_8 = \beta_5 (\eta_4) + \beta_7 (\eta_5) + \beta_{10} (\eta_6) + \beta_{11} (\eta_7) + \zeta_8$$

$$\eta_9 = \beta_4 (\eta_5) + \beta_{12} (\eta_8) + \beta_{13} (\eta_7) + \zeta_9$$

Measurement Equations:

$$X1 = \lambda_1 (\xi_1) + \delta_1$$

$$X2 = \lambda_2 (\xi_1) + \delta_2$$

$$X3 = \lambda_3 (\varepsilon_1) + \delta_3$$

$$X4 = \lambda_{13} (\varepsilon_2) + \delta_4$$

$$X5 = \lambda_{14} (\varepsilon_2) + \delta_5$$

$$X6 = \lambda_{15} (\varepsilon_2) + \delta_6$$

$$Y1 = \lambda_4 (\eta_1) + \varepsilon_1$$

$$Y2 = \lambda_5 (\eta_1) + \varepsilon_2$$

$$Y3 = \lambda_6 (\eta_1) + \varepsilon_3$$

$$Y4 = \lambda_7 (\eta_2) + \varepsilon_4$$

$$Y5 = \lambda_8 (\eta_2) + \varepsilon$$

$$Y6 = \lambda_9 (\eta_2) + \varepsilon_6$$

$$Y7 = \lambda_{10} (\eta_3) + \varepsilon_7$$

$$Y8 = \lambda_{11} (\eta_3) + \varepsilon_8$$

$$Y9 = \lambda_{12} (\eta_3) + \varepsilon_9$$

$$Y10 = \lambda_{16} (\eta_4) + \varepsilon_{10}$$

$$Y11 = \lambda_{17} (\eta_4) + \varepsilon_{11}$$

$$Y12 = \lambda_{18} (\eta_4) + \varepsilon_{12}$$

$$Y13 = \lambda_{19} (\eta_5) + \varepsilon_{13}$$

$$Y14 = \lambda_{20} (\eta_5) + \varepsilon_{14}$$

$$Y15 = \lambda_{21} (\eta_5) + \varepsilon_{15}$$

$$Y16 = \lambda_{22} (\eta_6) + \varepsilon_{16}$$

$$Y17 = \lambda_{23} (\eta_6) + \varepsilon_{17}$$

$$Y18 = \lambda_{24} (\eta_6) + \varepsilon_{18}$$

$$Y19 = \lambda_{25} (\eta_7) + \varepsilon_{19}$$

$$Y20 = \lambda_{26} (\eta_7) + \varepsilon_{20}$$

$$Y21 = \lambda_{27} (\eta_7) + \varepsilon_{21}$$

$$Y22 = \lambda_{28} (\eta_8) + \varepsilon_{22}$$

$$Y23 = \lambda_{29} (\eta_8) + \varepsilon_{23}$$

$$Y24 = \lambda_{30} (\eta_8) + \varepsilon_{24}$$

$$Y_{25} = \lambda_{31} (\eta_9) + \epsilon_{25}$$

$$Y_{26} = \lambda_{32} (\eta_9) + \epsilon_{26}$$

$$Y_{27} = \lambda_{33} (\eta_9) + \epsilon_{27}$$

Since to measure each latent variable, many observed variables (between 7 to 9) is used, for designing the questionnaire we are facing too many questions.

Also interviews of specialists and experts in Iran automotive industry and excellence award assessors, we have agreed to use AHP Technique, to determine the weight of observed variables and then we chose the three variables which had the highest weight, and removed those who had low weight were thus the use of AHP techniques, weight selection criteria in the table below.

Table 1: Chosen criteria by AHP technique and their weights.

Observable variables	weight	Observable variables	weight
Policy making for people	0.25	Marketing and communicating	0.33
Use feedback	0.3	Delivering service and products	0.16
Using innovating methodology	0.18	Guaranty and warranty	0.21
Opportunities to realize potential	0.17	To address feedback received from customers	0.15
Updating personal and team goals	0.22	To address feedback received from customers who are creating added value	0.26
Performance assessment	0.32	Advise customers to use the product	0.23
Support individual and team contributions	0.19	Delegation	0.24
Support creativity and innovation	0.26	Appreciate employees	0.22
Encourage employees to teamwork	0.27	Situation of work place	0.30
Identifying communication needs	0.21	Customer loyalty	0.25
Horizontal and vertical communications	0.19	Sales and Product services	0.28
Benchmarking and best practice	0.29	Image	0.22
Transmission of horizontal and vertical channels	0.30	Profit	0.27
Determine levels of employment benefits	0.21	Market share	0.21
Importance to various employees	0.23	Amount of Production	0.23
Using marketing research and survey feedback	0.25		
Create value for customers and partners	0.27		
Using employees competency for compatible products	0.20		

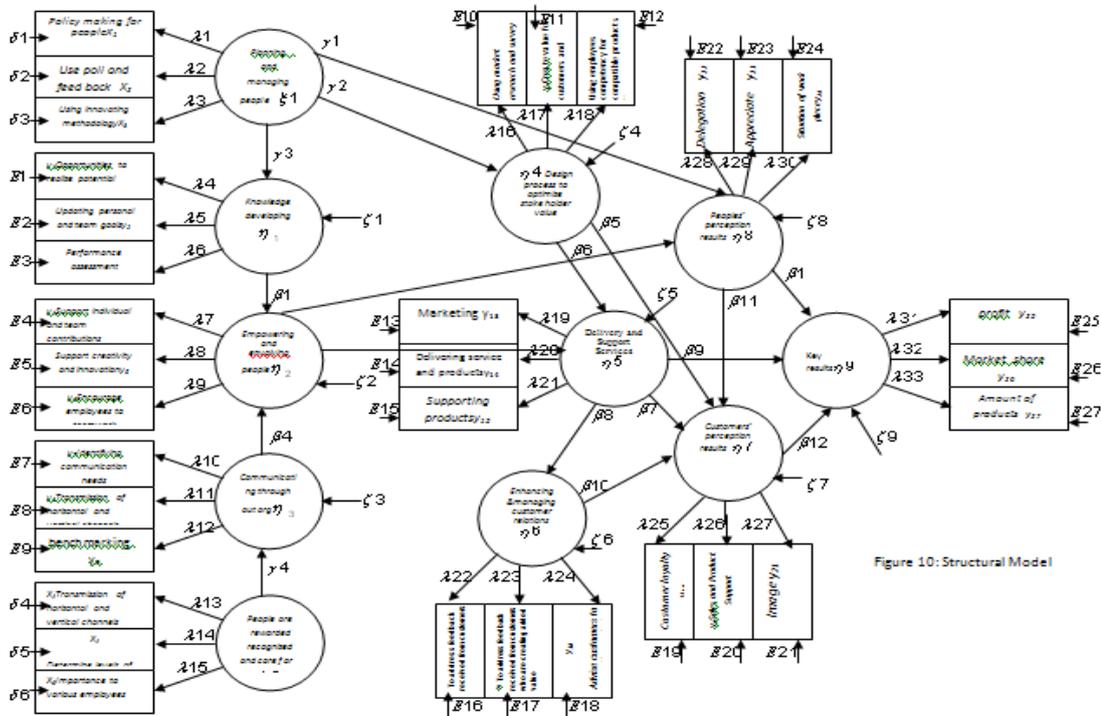


Figure 10: Structural Model

Empirical Results:

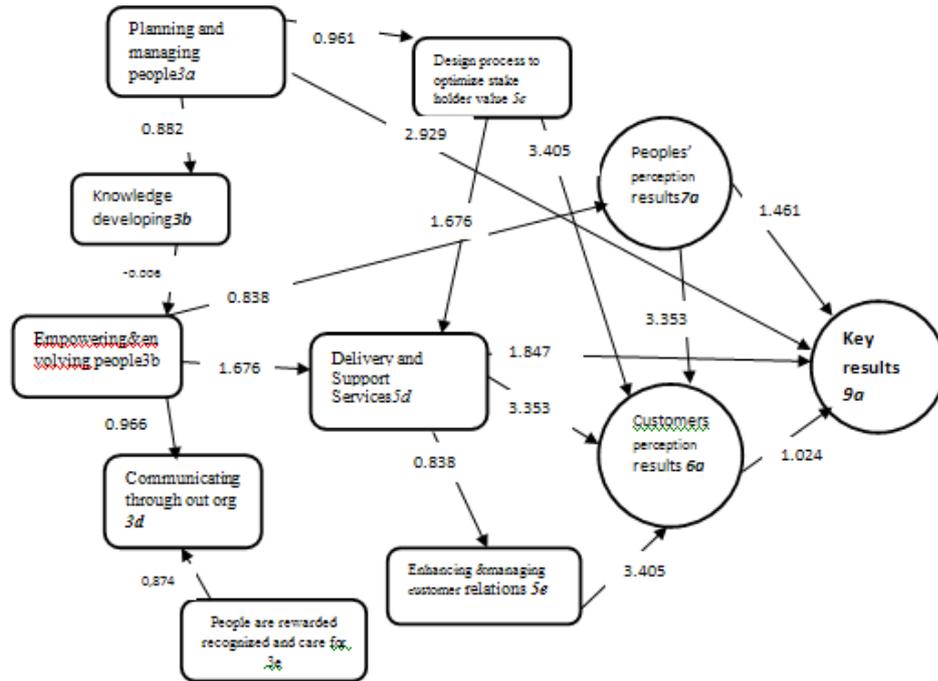


Fig. 11: Path Coefficients.

Here the three Hypothesis were rejected and route 3b to 3c , 5b to 9a and 6a to 9a with t-value respectly 1.2441, 0.0855 and 1.4024 are not confirmed.

Table 2: Goodness of Fit Statistics.

Latent variable	R ²	Overall Fit	
Planning and managing people	0.761	GFI	0.86
Knowledge developing	0.778	AGFI	0.84
Empowering & Envolving people	0.523	NFI	0.91
Communicating through out organization	0.764	IFI	0.91
People are rewarded recognized and care for	0.665	RFI	0.91
Design process to optimize stake holder value	0.723	NNFI	0.85
Delivery and Support Services	0.710	RMSEA	0.050
Enhancing &managing customer relations	0.502		
Peoples' perception results	0.702		
Customers perception results	0.429		
Key results	0.779		

In order to know how the whole model with experimental data is compatible, we do the overall fit of the model. There is a wide range of fit indexes to measure the overall fit of the model. Unfortunately, none of them is superior over another in all fields and in various conditions ,various people may use different indicators to assess the overall fit of the model(Byrne, 1998).

As shown in Table 2, the first two indicators are GFI and AGFI that should be between 0,1and Values greater than 0.1 indicates an acceptable fit of the model.

And between these values GFI is recommended to determine the absolute model fit (Mulaik,Etat;1981).

Also NFI,IFI,RFI and NNFI are relative indicators to show how the fit of the model is appropriate to the baseline model, which in fact is the independence model(Joreskog & Sorbom, 1989). Except Non-Normed Fit Index(NNFI) the rest of the indicators should be placed between 0 and 1 and whatever value is closer to 1 indicates good fit of the model but the value of a NNFI can also be larger than 1.

In the last row we have RMSEA if the value is between 0.05 to 0.08 fit is acceptable, between 0.08 to 0.1 the fit is moderate and larger than 1is week fitted (Maccallam, *et al.*, 1996).

In structural model, R^2 is amount of variance each endogenous latent variable that is explained by the independent exogenous latent variable shows. any amount of R^2 is greater, indicates that the power of variance explanation is more.

In this analysis all the parameters were significant and had the right sign and all of these, with overall fit measure suggests that our suggested model in figure 11 is reasonable match to the data.

Conclusion:

The survey of relationship between sub criterion of EFQM business model is shown be a critical responsibilities for managers. Each year Iranian auto industry managers use this tools to evaluate the whole components of supply chain that include auto makers companies, main auto parts suppliers, auto parts manufacturers, engineering services companies and commercial services companies. To identifying correct road map in order to directing companies, managers need to analysis of casualty relationship between criterion and sub criterion in EFQM business model and develop improvement projects. Since Automotive industry of Iran is a functional industry, the role and importance of human resource is so vital in it. Human resource is the most essential effective factor on the operation of companies and Iran's Automotive. To improve the key results of operation the causal direction must be known in EFQM business excellence model. This job is done in 2001 by Eskildsen. The main problem of Eskildsen's research is that he identified just the causal relationships between criteria while to define improvement projects causal relationships between sub criteria must be studied.

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