The Presentation of Hybrid Approach of MCDM Techniques, for Comparative Evaluation Access Strategies to World Class Manufacturing at Steel Industry

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ABSTRACT

One of the significant impact of changes that was conspicuous in 20th century in the environment of manufacturing and trading was the globalization phenomenon. In recent condition, manufacturing went behind the constraint border of decision in the realm of national and become as a global border in the terms of a strategic decision. The main goal of performing the existing research is the comparative evaluation and prioritizing the access strategies to the global levels .along with achieving to this goal, short review on the subjective literature related to the existing research was used from 12 number of experts and connoisseur in the field of steel industry, with usage of FSAW and FAHP methods mixture and with regards to four determined strategies (designing the productions according to the consumer's need, accepting new technology, improving the pro-sale services and diagnosing the new markets),the obtained results of the research reveals that accepting new technology strategy has priority among other strategies in achieving to theworld class manufacturing.
KEY WORDS: Comparative Evaluation, Strategies, world class manufacturing, MCDM, Steel Industry.

1- INTRODUCTION

One of the important matters in accessing to global levels is an appropriate compilation of organizational strategies with it. so, it is as a crucial matter in an organization that managers perceive the nature and vitality of strategy in the organization and support them in the along with achieving to the global levels. with their appropriate compilation with these strategies, they can utilize the most suitable producing methods (Farsijani, 2011).since covering a suitable strategy, gives the possibility of acting in the innovative and inventing way to the organizations and protect them against passivity actions on the subject of their future(wu et al, 2010). on the other hand strategies which are related to production has essential role in enhancement of organization competitive value and can meet them with the criteria of producing in global levels(Farsijani, 2011).the important of competitive debate in global level aggravated the sensitivity of various issues in the minute and major level(Smith, 2011).

Iran's steel industry with emphasizing on protecting the environment, progressing in quality and productivity with regards to requirements, has a dynamic and leading presence in the field of inside and global trading due to the advancement of its national advantages. nowadays our country has filled with relative advantages in the condition of steel manufacturing. among that we can name of viable and sufficient energy, limestone And primitive fireproof materials, relative experience in steel manufacturing, making use of young and expert working personnel, that together with achieving to the new manufacturing technology can have an effective and competitive role in the global steel markets(Afshar et al, 2010).taking into consideration the above factors, possessing to a strategy for acting in the international realm seems to be as a crucial matter.

Since various researches and studies have been done in the field world class manufacturing, few of them concentrated on selecting the appropriate strategy for achieving to the top and global levels in manufacturing. On the other side with taking in the consideration that the necessity credit for selecting and implementing the appropriate strategy in an organization must be based on experimental tests, for filling this gap (namely the gap between theory and experiment) we used of comprehensive and conceptual model of Yuksel and Dagdeviren(Yuksel&Dagdeviren, 2010). in fact in this existing research with consideration of environmental and surrounded conditions in desired industry ,tries to determine an appropriate solution and strategy for achieving to the greatest and global level of manufacturing with regards to the desired model in Mazandaran steel industry. Along with in achieving to this vital matter and for making heavier the four dimensional visions of balanced score card and every indices of these devices, we employed the FAHP technique. in addition for prioritizing and selecting the appropriate strategy attributable to world class manufacturing, we applied the FSAW technique. the obtained results of this method implementation in the mentioned model indicate that the

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higher priority in accepting strategy for new technology in the way of continuous modifying and improving of production quality is at the same direction of world class manufacturing.

2-world class manufacturing

Without any doubt one of the important effects of changing in 20th century in the producing and manufacturing environment is globalization and numerous competitors compete in the national and international sites around the world In this condition, production went beyond the simple decision making process in the national realm and reached to the global borders and transformed to a strategic decision. if nowadays in marketing, the market is equal to consumer and on the other hand this existing market is equivalent to global level, thus the consumer is attributed as a global consumer and in smaller amount it will be described in the constraint realm of nationality. in this field, the foundation of production and competition is changed and emerging of the new conditions obliged manufacturing companies to think about producing processes in the global visions and moreover it makes them to have re-evaluating to their visions about international competitions. Due to the rapid change of manufacturing technology and intense competition in 1970s decay, most of the companies, evaluated their activity and manufacturing strategies in various industry and used from new manufacturing approaches. According to the accomplished reviews, the successful manufacturing approaches up to year 1989 are as followings: worker's shared plan, comprehensive quality management, competitive manufacturing, inclusion of production in company strategy, reducing the dead line, preventive from retaining and repairing, statistical control process, designing with the assist of computer, manufacturing with assist of computer and controlling digital machine(Godarzi, 2005).in the accomplished researches in 1995,those approaches which emphasized more on human and strategic issues had numerous advocators than those which were based on algorithm and computer approaches. In 1995, other successful methods other than the above list were included: achieving to the zero waste rate (without spoiling),formation of working and competence groups of employees. In recent two decays, due to the intense competition, many of manufacturing companies revised their values, priorities and strategic goals as a result in the end obtained to determining manufacturing solution in the global scale. with altering the attention from manufacturing volume to manufacturing flexibility in the way that eventually enhancement have been done on production quality and responsibility rate, was one of the reason of this approach(Safaeighadikolaei, 2000).

Shonberger, coined the term of manufacturing in the global scale, for the first time in 1986.(Shonberger, 1986).And from that time to up it is used by various people. For describing this term we can state following descriptions:

"The unanimous agreement on continuous improvement of quality, cost, waiting time and consumer's servicing with the aim of fundamental flexibility of production as a section of this system".

"The appropriate mixture of terms such as just in time production, comprehensive quality management and participating employees for making production as a competitive and strong weapon for company".

"A wave that is set by formatting multi-disciplined teams that encompasses various concepts such as producing design, continuous process improvement, comprehensive quality management and generalization the quantity task for presenting new products accompanied by success, speed, less expenses and high quality in designing, development, producing and delivering to the consumer".

"A set of client-oriented, comprehensive quality management, just in time production management, continuous improvement, making employees involved in production, decision making and other processes"(Safaeighadikolaei, 2000).

With consideration to globalization in trading, information technology, time and place obstacles, all can omit the differences between small and large companies, thus, those small and agile companies can have effective competition with those large and giant companies. This state induces the new competition that surges on markets in an international border. still many managers in the companies are ignorant about the advantages of resulted strategic from implementing the manufacturing techniques in the global class and surprisingly they are still immobile in this field with regard to this matter that one of the vital obstacle towards production implementing in global class is shortage of knowledge(Farsijani, 2011).

Table No.1 presents some information about financial and strategic benefits of WCM

factors	Manufacturing expenses	Delay times	Existing og raw materials and manufacturing goods	Quality expenses	Manufacturing environment	Human power expenses	The new production developing time	Purchase expense
The reduction percentage	30-60	60-85	40-60	More than 50	30-65	30-65	30-60	30-50

2-1-LITERATURE REVIEW

In every practical research the specific attention of researcher on similar researches and their history, indicates the depth and pervasive nature of researcher's work. more reviewing on similar researches in addition of enhancing his ability and aptitude on subject, adds more credit to his research and points out his comprehensive and precise understanding from various dimensions in presented research. at the end, some results of related researches on this existing research subject are presented (Dargahi et al, 2012)(SafaeiGhadikolaei et al, 2012)(Aghajani&Dargahi, 2012)(Aghajani et al, 2012)(Gouranourimi et al, 2012)(Jahanbaz&Fallah, 2011) (Bandarian, 2008)(Abdi, 2008) (Ghazinoori&AliHamadi, 2008).furthermore we mentioned some new researches which were done in the field of global class.

SafaeiGhadikolaeiet al with the aim of evaluating the global class systems of Iran Khodro Co. and three Indian companies with usage of analyzing the performance value, come to this conclusion that Iran Khodro Co. had better performance just in two factors namely planning and manufacturing control and flexibility than its Indian competitor and in supreme management commitment and consumer's satisfaction and servicing had lower performance than its Indian competitor and had average in other factors. At the end it is recommended that Iran Khodro Co. for achieving superiority on other manufacturers in the global realm, must have more attention on all critical factors and pay specific attention on above critical factors on supreme commitment management and consumer's satisfaction and servicing (SafaeiGhadikolaei et al, 2011).

Eid. R in the paper entitled (the effective factors on successful implementing of world class manufacturing in developing countries, Egypt's case study ,with mentioning that manufacturing companies need to understand that which factors have vital roles in implementing the WCM techniques, categorized seven critical factors to two clusters that the first cluster are WCM strategy reinforcement including as following : management commitment ,quality sector, consumer's participating and continuous improvement. The second cluster are tactical WCM strategy that includes :supply chain management, technical improvement management and manufacturing facilities management. In the rest experimental studies from the 96 samples selected among Egypt manufacturing companies, as a result come to this conclusion that the strategic WCM factor and tactical successful factors have significant effects on WCM successfulness and moreover it is mentioned that some strategic reinforcements have significant effects on tactical reinforcements as well(Eid, 2009).

Sangwanand Digalwarin the study entitled "the evaluation of manufacturing systems in global class, a case study of automobile industry in India with reviewing on 172 subjective literature recognized the performance variables for evaluating WCM systems. At the rest,73 performing variables from all 172 reliable variables were recognized , with the usage of nominal group technique in 12 cluster critical factors categorized and then by using from the performing value analysis, the obtained results from 3 active companies in automobile industry of India got theMalkolmBaldrigNational Quality Award and Rajiv Gandhi National quality award and etc together in the field of succession in manufacturing systems rate in global class were compared. eventually the writers claimed that the presented model and algorithm with usage of a case study has the required validity and reliability and can be used for evaluating in automobile industry in global(Sangwan&Digalwar, 2008).

Salahedinand Eidwith the goal of implementing the production techniques in global class at Egypt's company and also preparing guideline for successful execution in global class level concluded that reducing in activation cost (marketing and producing) and global issues (environmental market)are considered as an important variables for WCM implementation. they also found that a poor program and lacking of the sufficient knowledge are considered as an important obstacles for WCM implementation in Egypt's company. At the end they recommended that WCM implementation requires growing up in knowledge level and stated that the enthusiastic company for WCM implementation must conceive this important matter and they also must have resolute in carrying out this program up to the time that they get to the desired benefit(Salahedin& Eid,2007).

Farsijany and Teymoriyan with the goal of successful factors survey in the transmitting technology for achieving to the global level with usage of track analysis in Hapko company concluded that there is a significant positive relationship between succession in technology transmitting and reaching the global class level and also factors like reduction in waiting time, effective management, financial resources and costumer's satisfaction have positive effect on transmitting technology. At the end for participating companies in global class level, they presented some useful recommendations(Farsijany&Teymoriyan, 2010).

3-Questions and research goals

In this study research questions are as following:

1- What is the important degree (weight) in BSC four aspects inYuksel and Dagdevirenmodel?

2-what is the important degree (weight) of domesticated criteria in every BSC four aspects in Yuksel and Dagdevirenmodel?

3-according to the desired model what is the most suitable strategy for achieving to manufacturing superiority and the global class?

The main goal of performing this study is prioritizing or it is done for comparative evaluating between strategies of achieving to the global class, other goals of this research can be stated as following:

1-domesticating the presented model by Yuksel and Dagdevirenin steel industry.

2-Alloting suitable resources and facilities to the under studied industry according to the research results,

3-Illuminating the proceeding solutions toward desired company according to the environmental and surrounded conditions.

4-RESAERCH METHODOLOGY

4-1- Statistical population

In this study some fundamental opinions were used as samples from 12 experts and connoisseur in the desired company whom had a vital and critical roles in decision making process in all aspects of minute and major issues of their company. This population was included of 92 percent from male employees,83 percent had an average age more than 30,92 percent had academic education in AM or higher levels and also 52 percent from this population had job experience more than 10 years.

4-2- Data and evaluating scale

For collecting data in this study, two method was used; library method and field method, for writing the research literature the library method, scientific journals, and various scientific data base were used. The main data of this study was collected with field method via distributing questionnaires and interviewing with people. in this study two type of questionnaire were used that after designing the preliminary questionnaire and receiving expert's opinions ,during some stages and final revising ,the final questionnaire personally was handed out to them.

The first questionnaire was distributed by reason of domesticating the research model in steel industry among connoisseurs, for accomplishing this goal at first connoisseurs were asked to determine the importance degree of model strategies in steel industry and indices determined according to scale 1 (insignificant) to scale 10 (critical).

Then it was asked from connoisseurs that what useful strategies and indices were absent from the presented model. then they must determine their importance degree from scale 1 (insignificant) to scale 10 (critical) then at last all indices selected which their importance degree was more than 7.the second questionnaire was included in questions related to importance degree of four aspects of balanced score card , indices importance degree of these aspects and at last it was composed of strategies importance degree of achieving to world class manufacturing in the mentioned model, distributed among connoisseurs.

this questionnaire is composed of three sections; the first section is included in carrying out the pair comparative to determine four aspects priority degree of BSC rather to each other. Moreover by presenting a guideline sheet for filling out the questionnaire, the way of filling out the questionnaire was trained to members of statistical population and during filling out process, the researcher himself was present to efface any possible ambiguity. in general 12 questionnaires were distributed and collected that the analysis of existing study results were done based on the collected questionnaires.

5- FINDINGS ANALYSIS

5-1- Data conversion

The statistical sample answerer's opinions regards to the dimensions, study strategies and indices collected based on clock 9 sectional scale can be transformed to triangular Fuzzy digits by various methods(lee, 2010)(Yang&Hsieh, 2009)(Sun, 2010). colloquial scale to determine four weight aspects of BSC and the indices for these aspects are presented in below table:

Table NO.2:Fuzzy evaluation scores for the weights

Linguistic terms	VL	L	ML	H	VH
Triangular fuzzy numbers	(1, 1, 1)	(1, 3, 5)	(3, 5, 7)	(5, 7, 9)	(7, 9, 11)

moreover colloquial scale to determine the priorities of the accessing strategies to the world class manufacturing are presented in below table:

Fable NO.3:Fuzzy evaluation scores for the alternatives

Linguistic terms	W	P	F	G	B
Triangular fuzzy numbers	(0, 0, 2.5)	(0, 2.5, 5)	(2.5, 5, 7.5)	(5, 7.5, 10)	(7.5, 10, 10)

5-2-The design of research hierarchical pattern

After distributing the first stage questionnaire and applying appropriate changes or in other word its domesticating of conceptual model of Yuksel and Dagdeviren, eventually the formation of utilized hierarchical

for evaluating and prioritizing of accessing strategies to world class manufacturing are according to the following fig:
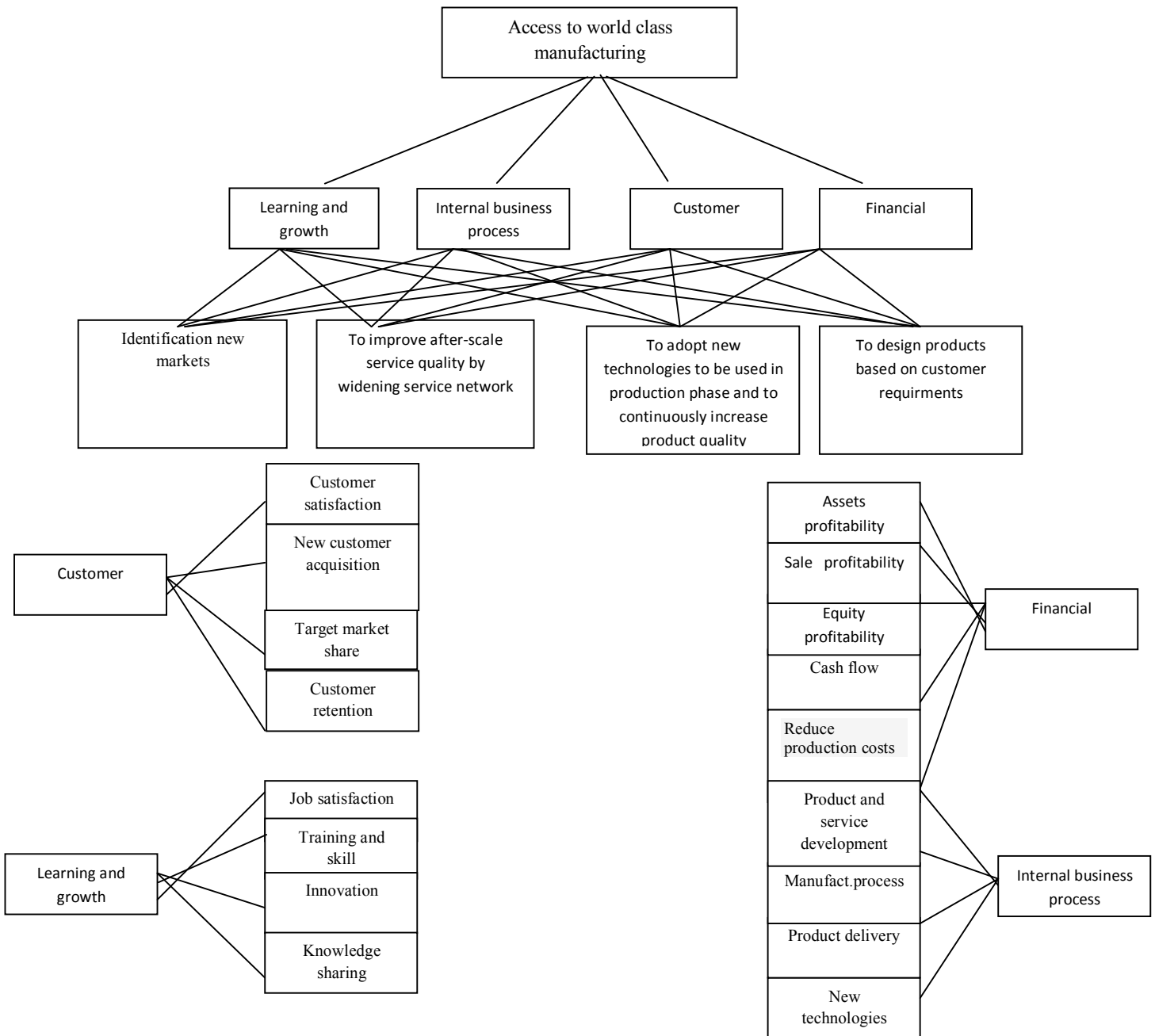

Fig.1: the hierarchical formation of dimensions ,indices and accessing strategies to world class manufacturing

5-3- Answering to the research questions

As mentioned in the previous sections valuation to the four aspects of BSC and their indices are based on panel FAHP that this method is done by Chang method (Chang, 1996).with regards to this matter, from the graphic average of 12 questionnaires obtained by triangular Fuzzy digit pair comparative matrix, the collective matrix form expert's ideas is according to table NO.3

Table NO.3: matrix form expert's ideas

AccessTo world class manufacturing	Financial	Customer	Internal business process	Learning and growth
Financial	(1,1,1)	(0.74,0.965,1.265)	(0.812,1.106,1.456)	(0.87,1.183,1.527)
Customer	(0.79,1.035,1.349)	(1,1,1)	(0.615,0.901,1.353)	(0.841,1.224,1.674)
Internal business process	(0.686,0.903,1.23)	(0.738,1.109,1.623)	(1,1,1)	(0.784,1.034,1.342)
Learning and growth	(0.654,0.844,1.148)	(0.597,0.816,1.188)	(0.745,0.966,1.274)	(1,1,1)

Moreover we calculated the amount of Fuzzy compound package from every aspect.

$$\left[\sum\sum M_{ij}\right]^{-1} = (12.878, 16.093, 20.434)^{-1} = (0.0489, 0.0621, 0.077)$$
$$SC_1 = [(3.423 * 0.0489, 4.256 * 0.0621, 5.249 * 0.077)] = (0.167, 0.264, 0.407)$$
$$SC_2 = (0.158. 0.258, 0.417)$$
$$SC_3 = (0.157. 0.251, 0.403)$$
$$SC_4 = (0.146. 0.225, 0.358)$$

after obtaining to the amount of Fuzzy compound package, the possibility degree for every possible binary state is calculated according to table NO.4 and then we calculated the minimum amount of possibility degree of every aspect rather than other aspects up to get to the weight diagram of four aspects according to table NO.5

Table NO.4: the possibility degree for every binary state

$sc_1 \geq sc_2 = 1$	
$sc_1 \geq sc_3 = 1$	sc
$sc_1 \geq sc_4 = 1$	

Table NO.5: the final weight of aspects

aspect	Financial	Customer	Internal business process	Learning and growth
Minimum degree of feasibility	1	0.976	0.947	0.829
The final weight	0.266	0.26	0.252	0.221

For answering to the first research question, by usage of FAHP method and relating to the results in table NO.4 it is determined that from connoisseurs and experts' view point of steel industry, the financial aspect is the most important aspect from four aspects of BSC for achieving to the main goal of the research. the arrangement of priority and significance of other aspects are as following: costumer, internal process and learning and development.

We act like above stages for answering to the second research question namely the determination of aspect priority of every four aspects .So due to the high amount of calculations we just displayed the foundlings of final weights of every seventeen indices according to the table NO.6

Table NO.6 : the final weight of BSC indices with FAHP method

Weights of indicators	indicators			Weights aspect
	Weights	indicators	Weights of aspect	
0.052	0.197	Assets profitability	0.266	Financial
0.049	0.185	Sale profitability		
0.054	0.205	Equity profitability		
0.056	0.211	Cash flow		
0.053	0.199	Reduce production costs		
0.073	0.284	Customer satisfaction	0.26	Customer
0.061	0.234	New customer acquisition		
0.058	0.223	Target market share		
0.066	0.257	Customer retention		
0.059	0.237	Product and service development	0.252	Internal business process
0.064	0.255	Manufact. process		
0.062	0.249	Product delivery		
0.065	0.258	New technologies		
0.061	0.277	Job satisfaction	0.221	Learning and growth
0.051	0.23	Training and skill		
0.058	0.263	Innovation		
0.05	0.227	Knowledge sharing		

According to the obtained results from FAHP process in table NO.5,the arraignment of every four aspects of BSC indices priority for achieving to the main goal of research was determined, thus the index of customer's satisfaction and customer's maintaining have higher priority and indices like purchase benefits and shared knowledge have lower priority in this findings.

For answering to the third research question namely the determination of strategy priority in accessing to world class manufacturing we used from FSAW (Tzeng&Huang, 2007) and fuzzy numberfrom table NO.2

The normal matrix of connoisseurs and expert's total opinions are according to table NO.7

Table NO.7: the normal matrix of connoisseurs and expert's total opinions

	Assets profitability	Sale profitability	....	Innovation	Knowledge sharing
To design products based on customer requirments	(0.28, 0.451, 0.702)	(0.384, 0.589, 0.957)	...	(0.501, 0.728, 0.856)	(0.405, 0.534,0.856)
To adopt new technologies to be used in production phase and to continuously increase product quality	(0.38, 0.525,1)	(0,0.251,0.486)	...	(0.68, 0.794, 1)	(0.524, 0.786, 1)
To improve after-scale service quality by widening service network	(0.289,0.578,0.792)	(0.721, 0.952, 1)	...	(0.253,0,0.476)	(0,0.356, 0.621)
Identification new markets	(0.324, 0.628, 0.803)	(0.286,.5680,0.589)	...	(0, 0.357, 0.685)	(0.215 , 0.542 ,0.753)

The rest of stages from FSAW method are as follows:

$$Strategy-1 = [0.0527(0.28, 0.451, 0.702) + \cdots + 0.502(0.405, 0.534, 0.856)] = (0.36, 0.576, 0.872)$$

$$Strategy-2 = [0.0527(0.38, 0.525, 1) + \cdots + 0.502(0.524, 0.786, 1)] = (0.348, 0.599, 0.891)$$

$$Strategy-3 = [0.0527(0.289, 0.578, 0.792) + \cdots + 0.502(0, 0.356, 0.621)] = (0.151, 0.306, 0.713)$$

$$Strategy-4 = [0.0527(0.324, 0.628, 0.803) + \cdots + 0.502(0.215, 0.542, 0.753)] = (0.133, 0.39, 0.739)$$

After de-Fuzzing the related amounts to every result strategy can be shown according to table NO.8

Strategies to achieve world class manufacturing	Fuzzy values of each strategy	De-Fuzzy values of each strategy	The final priority of each strategy
To design products based on customer requirments	(0.36, 0.576, 0.872)	0.602	2
To adopt new technologies to be used in production phase and to continuously increase product quality	(0.348, 0.599, 0.891)	0.612	1
To improve after-scale service quality by widening service network	(0.151, 0.306, 0.713)	0.39	4
Identification new markets	(0.133, 0.39, 0.739)	0.42	3

The result of table NO.8 indicates that the highest priority is gotten by adjusting new technology for transmitting and continuous improvement of production quality along with accessing to the world class manufacturing.

6-Discussion,conclusion and presentation of some recommendations:

The existing research was in the track of comparative evaluation or in other word prioritizing the achieving strategies to the world class manufacturing .but here a vital point arises which is that in research process, most of the variables are mentioned in the form of nominal ,quality and verbal variables and their evaluation by decisive methods and digital mathematics numbers seems to be impossible.

The outstanding matter about this research is its innovation in mixing two AHP and SAW techniques together in the fuzzy environment for eradicating this problem. In fact researchers with usage of fuzzy conceptual, applied verbal phrases as phrases with natural and colloquial language for evaluating the strategies and also for more appropriate and precise analysis they applied some changes on them. The obtained results from FAHP method implementation indicates the high significance of financial aspect and furthermore it points out the place of indices like customer's satisfaction and customer's maintenance along with accessing to the main goal of the research.

At the rest of the research with usage of SAW technique and according to the utilized criteria in this research the access strategies to the world class manufacturing become prioritized and in the end this founding was obtained that the strategy of accepting new technology for transmitting and continuous improving of production quality was ascertained as the most appropriate strategy for accessing to the manufacturing superiority and world class.

The complexity of management decision and aroused conflict relationship transaction nature in a collective decision making and discussions related to hierarchical issues, all can diminish the quality of decisions associated with selecting an appropriate strategy. The usage of BSC,FAHP and FSAW mixture in relationship to determine the best strategy by organization can contribute a good opportunity to managers for getting rid of problems which comes forward from traditional collective decision making in anticipation of applying the practical recommendations for increasing the quality of decisions. According to the obtained results from the research, the practical recommendation for getting to the superiority level and world manufacturing are presented to the competent managers and in responsible people in steel industry as following:

With regard to this matter that selecting an appropriate strategy usually is considered as a fundamental step to diminish occurring any casual decision making by managers responsible people, steel industry and managers can organize their activities according to the centralizing the selected strategy. So it is important that responsible people and managers of under study companies in Mazandaran province for implementing the strategy ,accomplish logical and useful planning.

With regard to this matter that nowadays the rate of changing is at high level and the rate of change means that the strategy must be flexible, it is recommended to the mentioned responsible people and managers that they must not overlook the strategic management power as a superficial program making process but they must perceive it as a linked loops of chain that is composed of organizational learning, that balances in these strategies are related to that learning processes. In fact this kind of learning must be based on pivot capability and the changes occurred on environment.

With regard to this matter that the strategy of accepting new technology for transformation and continuous improvement of production quality was considered as the most appropriate strategy for accessing to the global and superiority of production in steel industry, and also taking to consideration that advanced technologies changed as one of the critical triggers in productivity increasing at company, in favor of competing in global environment, the ability of achieving to the new technology and its impact on the under study companies are crucial so it is recommended that managers and responsible people take into action a type of appropriate technology with dominant atmosphere and formation on their company in support of activity and competing in global level.

With regard to the high significance of financial aspects along with achieving to the existing research goal, so it is recommended that company management for performance evaluation and finding weakness and power points and also determining the potential damages ,use from the financial relationships. On the other hand in view of the importance of this relations for managers, costumers and also for lending institutions it is vital that managers of these two under studied companies intended for controlling and evaluating of these relations and also improving of these relations the appropriate decision adopting a perfect actions.

With regard to the high significance of costumer's satisfaction and customer's maintenance indices, the recommendations of applying and designing management systems of relationship with costumer and costumer's knowledge management on the subject of preferences to the specific production by the use of data mining techniques to boost the customer's satisfaction and customer's maintaining.

7- REFERENCES

[1]AbdiMansoureh, Amin Naseri Mohammad Reza, ShariatiNiasarMojtaba, Prioritizing Nanotechnology Applications for the Upstream Oil Industries of Iran ,Journal of Science and Technology Policy, 2008; 1 (2) :29-42

[2]AfsharKazemi,M.A., Makoii, A,.Darman, Z.,(2010)., supplying chain Strategy developing of Iran's steel industry using of analyzed systems , Research Business Journal , Vol 50 , pp 201-224.

[3]Aghajani,H. Dargahi,H.(2012)., the usage of FVIKOR technique to solve problems in the supply chain of suppliers : Case study of Iran Khodro Co. , Second International Conference on problem solvingstrategy & techniques., Tehran, Iran.

[4]Aghajani, h., Sedaghat, m., Dargahi, h., Pourhossein, m.,(2012).,Applying VIKOR, TOPSIS and SAW in fuzzy Environment for Ranking Suppliers in Supply Chain: A Case study., American Journal of Scientific Research, vol. 48, pp 10-19.

[5]Bandarian Reza, Measuring Commercial Potential of Technology with Fuzzy Logic ,Journal of Science and Technology Policy, 2008; 1 (1) :15-32

[6]Dargahi,H. Fallah,Y. Ismaiili, F.,(2012)., the implementation of Multi-criteria decision making techniques used in the ranking of barriers of mobile commercial (The case study : township Ghaemshahr) , Second International Conference on e-citizen&Cellphone, Tehran, Iran.

[7]Eid, R.,(2009).,Factors affecting the success of world class manufacturing implementation in less developed countries, The case of Egypt , Journal of Manufacturing Technology Management, Vol. 20 No. 7.

[8]Farsijani,H.,(2011) world class manufacturing methods and operations , Tehran , Research and develop organizations of human sciences books universities.

[9]Farsijani,H. Teymoriyan, M.,(2010)., the study of technology transferring Success factors to achieve world-class (The case study : Hepko Company) ., management perspective , No.32, Pp 151-168.

[10]GhazinooriSoroush, Ali HamadiAlireza, Prioritizing policy instruments for supporting new technology-based firms in Iran, using a fuzzy MCDM model ,Journal of Science and Technology Policy, 2008; 1 (3) :73-79

[11]Godarzy, G.R.,(2005).,the designing of a strategic decision making of tools supply chain in the global scale production, Ph.D. dissertation, TarbiyatmodaresUniversity, Iran.

[12]Goranourimi.F., Dargahi.h.,Sedaghat. M., Moakher.A.K.,(2012)., Ranking Suppliers in Supply Chain Using Fuzzy Multi-Attribute Decision Making Model: A Case Study in Iran Automobile Compant., American journal of Scientific Research, vol0 42., pp: 5-11.

[13]Jahanbaz Ahmad, Fallah Hassan, Presenting a Method for Priority Setting and Budgeting of Research Subjects with the Purpose of Economic Activities Develop ,Journal of Science and Technology Policy, 2011; 3 (3) :79-92

[14]Lee, S.H.,(2010)., using fuzzy AHP to develop intellectual capital evaluation model for assessing their performance contribution in a university , Expert systems with Application., 37, pp: 4941-4947.

[15]SafaeiGhadikolaei,A.H.,(2000)., Principles of production implementing on global scale in automobile companies , Ph.D. dissertation ,Tarbiyatmodares University, Iran.

[16]SafaeiGhadikolaei,A.H. Dargahy,H. Mosavy,S.F(2012). Providing a Fuzzy approach to determine the competitive position of media tools , Second National Conference on Application Fuzzy Logic in Media Sciences, Tehran, Iran.

[17]SafaeiGhadikolaei, A., Baboli, A. M., Elyasi, Z., Akbarzadeh,Z.,(2011)., Comparison of Comparitive World-Class Manufacturing in the Iranian and Indian Automotive industries With PVA Algorithm(Case Study: Irankhodro company)., European Journal of Scientific Research., vol.61., pp:273-281.

[18]Salahedin, S .I., Eid, R.,(2007).,The implementation of world class manufacturing techniques in Egyptian manufacturing firms: An empirical study., Industrial Management & Data Systems., Vol 107., No4.,pp.551-566.

[19]Sangwan K.S. &Digalwar A.K.,(2008).,Evaluation of world-class manufacturing systems: a case of Indian automotive industries., Int. J. Services and Operations Management, Vol. 4, No. 6.

[20]Schonberger, J. R.i chard,(1986)., World Class Manufacturing: the lesson of simplicity applied, the free press, New York.

[21]Smith.A.D.,(2011)., Component part quality assurance concerns and standards Comparison of world – class manufacturing., Benchmarking: An International Journa", vol. 18. Pp: 128-148.

[22]Sun, C.C ,(2010)., A performance evaluation model by integrating fuzzy AHP and fuzzy TOPSIS methods , Expert systems with Application., 37, pp: 7745-7754.

[23]Tzeng. G-H& Huang. JJ.(2007).,NEW FRONTIERS OF MULTIPLE ATTRIBUTE DECISION MAKING., KAINAN UNIVERSITY.

[24]Wu. C-S., Lin. C-T., Lee. C.,(2010)., Optimal marketing strategy: A decision- making with ANP and TOPSIS., Int.J. Production Economics.,vol.127., pp: 190-196.

[25]Yang, T& Hsieh, C.H,(2009)., Six- sigma project selection using national quality award criteria and Delphi fuzzy multiple criteria decision- making method , Expert systems with Application., 36, pp: 7594-7603.

[26]Yuksel, ihsan. Dagdeviren, metin,(2010)., Using the fuzzy analytic process(ANP) for Balanced Scorecard(BSC): A case study for manufacturing frim, Expert Systems With Applications, vol:37, pp: 1270-1278.