

## **A New Model of Topsis, AHP & Delphi to Evaluation of Affecting Factors on BSC Implementation A Case Study from Iran's Aviation Industry**

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### **Abstract**

One of the most significant subject areas within ever-changing, hyper-competition and complicated business environment is strategy. The strategy implementing is a complicated challenge in corporations and organizations. In order to act in response these kinds of challenge, Robert Kaplan and David Norton (1992) introduced a management system known as balanced scorecard (BSC). Through translating organizational strategy and perspective to comprehensible terms, balanced scorecard avoids various perceptions and it helps strategy effective implementation by synchronizing individual and organizational goals. Since BSC implementation is various in terms of organizational and cultural structure of firms, identifying factors to improve BSC implementation are vital. In current study, our aim is to propose a new integrated model to identify and rank affecting factors on the success of BSC implementation by using Delphi, AHP and TOPSIS methods. Research sample includes 14 expert of navigation industry and faculty determined through judgment. Affecting factors identified from literature and finalized by Delphi method. Then, weighted by Analytic Hierarchy Process (AHP) and ultimately ranked by TOPSIS method. Result show that rank one is supposed to be strategic issues which point out its significance in implementing balanced scorecard. Management commitment ranked the second that indicates the significant of top management in BSC implementation.

**Key words:** BSC, Strategy implementation, Delphi, TOPSIS, AHP

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### **Introduction**

In several years, from a tool provided by Kaplan and Norton (1992) to assess the performance, BSC changed to a tool implement strategies (Kaplan and Norton, 1995). Strategy implementation is a set of choices and activities necessary to execute a strategic plan. In strategy implementation phase, policies and strategies are executed and practiced by using plans. This phase is too vital in the framework of organizational strategic management since 70% of administrators' failures were in strategy formulation rather than weak implementation of devised strategy (Niven, 2007: 25). Based on studies conducted by Robert Kaplan and David Norton (1993) in over 500 industrial units, many top administrators were not satisfied with strategy implementation in their organizations and they pointed out managerial and operational barriers, employees and lack of contribution in various level of strategic planning process to implement strategies effectively. Balanced scorecard method provided a proper guideline to respond such challenge and was highly welcomes by management connoisseurs and administrators in organizations. However, success in BSC implementation is especially significant. Since BSC implementation is various in terms of organizational and cultural structure of firms, it needs factors and grounds to improve BSC implementation and to execute this system in organizations effectively (Sajedi, Arman, 1979). By translating organizational strategy and perspective to comprehensible terms, BSC avoids various perceptions and it helps strategy effective implementation by synchronizing individual and organizational goals. Affecting factors on the success of BSC implementation facilitate the process of its implementation. Identifying and understanding their significance and priority would guide BSC implementation in organizations. Broad studies are conducted in this regard. In current study, our aim is to provide a new integrated model to identify and rank affecting factors on the success of BSC implementation by using the integration of qualitative and quantitative methods including Delphi, AHP and TOPSIS. To this end, affecting factors finalization was conducted by Delphi method. Then, they were weighted by Analytical Hierarchical Process (AHP) and they were ultimately ranked by TOPSIS process.

### **Literature Review**

#### **Balanced Scorecard (BSC)**

Kaplan and Norton (1991) provided the method of balanced performance appraisal or balanced scorecard for the first time which called strategic management system in next decades since this method is used not only to assess performance but also as a framework to formulate strategy, to communicate and to control strategy implementation (Kaplan and Norton, 2001). The philosophy and nature of this method is that it converts organizational perspective, mission and strategy to proper goals and sizes. Such goals and sizes are expressed in four financial, customer, and internal business process and learning/growth outlooks. In turn, by utilizing this model in organization, relevant aims are determined in each BSC perspective and by such aims, measures are selected to calibrate them (Kaplan and Norton 1996a). This method covers all financial and nonfinancial aspects of an organization's performance and establishes equilibrium between sizes of past performance and the stimulants of future performance (Kaplan and Norton, 1996b). In fact, effective companies are not just relying upon financial indicators for their performance appraisal and they also evaluate their performance in other three BSC perspectives namely customer, internal process and learning/growth (Kaplan and Norton, 1992).

### Delphi Method

Delphi method is used for identifying and screening the most significant decision making indicators. Although it is not a multi-attribute decision making method, it is used in many cases before using multi criteria decision making (MCDM) method to screen indicators or to achieve a concurrence on the significance of decision making indicators (Habibi et al, 2014). Delphi is a recursive process in usually three or four steps. It requires a series of questionnaires, each one devised by the results of past round. The results of each step are gathered and returned to participants. During sequential repetitions, participants can assess their responses based on collected questionnaires from all other respondents. Questionnaires are structured unanimously. Respondents are known for researchers but not necessarily for other respondents. It improves the possibility of considering the responses without any personal impact on stated ideas (Summerville, 2008). In present study, Delphi method is used to finalize affecting factors. Therefore, Delphi implementation steps were conducted to finalize the factors.

### Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process (AHP) is a multi-attribute decision making method which can be used in prioritization. AHP is asset of judgments and valuations rationally (Saaty, 1980: 62). AHP has involved several items in prioritization and makes it possible to consider various qualitative and quantitative measures. A unique feature of multi-attribute decision making is to determine the amount of adaptability and inadaptability (Chinese, et al 2011: 559). Another advantage is to structure decision making by developing a hierarchy. Other capabilities of AHP include easy comprehension, providing a structure for collective cooperation and contribution in decision making, using both systemic attitude and step-by-step analysis to resolve the problems and a measurement scale uniquely for this method (Saaty, 1980: 118). In present study, AHP is used to weight main factors which include 10 final factors extracted from Delphi method.

### Topsis

TOPSIS method was introduced by Hwang and Yoon in 1981. On this basis, each MADM-type problem with  $m$  option evaluated by index  $n$  can be seen as a geometric system which  $m$  point in an aspect space (Wang and Yoon, 1995). TOPSIS is established on this concept that selected option has the shortest distance from ideal solution (the best possible way) and longest distance from negative ideal solution (the worst possible way). It is assumed the utility of each indicator is smoothly increasing (decreasing). It means that more  $r_{ij}$  would lead into more utility or vice versa. In present study, TOPSIS method is used to prioritize main and sub factors.

### Reviewing Previous Studies

Following to a study by Robert Kaplan and Noorein Inamdar titled "Applying the Balanced Scorecard in Healthcare Provider Organizations", published in Health Management Journal in 2002, five affecting factors on effective implementation of BSC were raised (Kaplan, R.S.; Inamdar, N, 2002):

1. Assuring the possibility of implementing BSC and organizational readiness/capability in executing this method
2. Paying attention to implementation management and developing BSC process
3. Training management before, during and after process implementation (Learning feedback and process)
4. Supporting changes in roles and communications in various divisions
5. A systemic attitude and using BSC as a strategy management system instead of measurement system

Likewise, Paul Niven (2002) studied the barriers on effective implementation of BSC as below (Niven, P. R. 2002):

1. Not executing BSC in all organizational levels
2. Technical terms and idioms
3. Lack of new measurements
4. Sustainable management style
5. Time adjustment
6. Lack of a target to execute the model
7. Lack of strategy
8. Lack of BSC training

Following to results of study by Sriwipa Siripunyawit (2004) titled "Corporate Culture is key to effective Balanced Scorecard program" in Thailand; two affecting factors on effective implementation of BSC were mentioned:

1. Leadership
2. Corporate culture

In his study on "Balanced Scorecard eases compensation", Boomer (2004) pointed out two influencing factors on BSC effective implementation (Boomer, G. L., 2004):

1. Effective communications
2. Tight understanding of perspective and mission in all organizational levels

In another study titled "The Balanced Scorecard: To Adopt or not to Adopt?" by Hendricks & Menor & Wiedman (2004), below factors were mentioned in formulating and implementing BSC (Hendricks, K.; Menor, L.; Wiedman, C., 2004):

1. Clear expression of firm's perspective and business strategy
2. Clarifying performance categories which related perspective and strategy to results
3. Developing effecting scales and meaningful standard (either short or long term)
4. Extending proper budget IT, communications and award system
5. Considering BSC as a continuous system which needs maintenance, support, re-measurement and updating
6. The belief that BSC acts as a facilitator of organizational and cultural changes

In 2004, Mohan pointed out 6 affecting factors on BSC effective implementation:

1. Self-recognition and awareness (organization)
2. Recognizing and comprehending BSC learning cycle
3. Recognizing BSC implementation roadmap
4. Behaving BSC as a project

5. Using technology as an enabler
6. Executing BSC organization-wide

In another study conducted by Molleman (2007) titled "The Challenge of Implementing the Balanced Scorecard", affecting factors on BSC effective implementation were explained as below (Molleman, B., 2007):

1. Acquiring the balance between back-casting (proper combinations of deliverables) and forecasting indicators (performance stimulants) which need more measurements in each aspect of BSC (Kaplan, R.S.; Norton, D.P., 2001).
2. Only those indicators are plausible that are more vital and reflect organizational strategy (otherwise, the organization would lose its concentration to find relations among indicators (Kaplan, R.S.; Norton, D.P., 2001).
3. Commitment and support by top management (Braam, G.J.M. and Nijsen, E.J., 2004).
4. Senior management team should altogether execute and support this model (Kaplan, R.S.; Norton, D.P., 2001)
5. All organizational levels should be involved in implementation process (Kaplan, R.S.; Norton, D.P., 2001; Andersen, H.; Cobbold, I.; Lawrie G., 2001)
6. Development process should conducted in short time (if it takes long time to implement, it is likely that strategies are changed during implementation process (Braam, G.J.M. and Nijsen, E.J., 2004).
7. Do not establish a quantitative relationship between nonfinancial indicators and expected financial results (Schneiderman, A.M., 1999). By expounding and reviewing relevant literature and considering previous studies, 31 sub factors were selected as initial affecting sub factors on BSC effective implementation. They are initial entering factors into Delphi process.

### Methodology

Provided model is an integration of Delphi, AHP and TOPSIS methods. In the first step, Delphi method is used to finalize extracted model from literature. Then, AHP is conducted to determine the weight of each factor. Ultimately, by using achieved weights, TOPSIS process is conducted for ranking. Case study is a public organization and research sample consists of 14 experts and faculties selected by judgment.

### Data Analysis

Delphi process was conducted by 31 recognized sub factors. Its analysis steps can be seen in table1. Ultimately, 29 sub factors were selected.

**Table1.**Delphi process

Row	Main factor and sub-factor	First round	Second round	Third round	Final indicator	
1	Mission, perspective and values of the industry	Full commensurate and transparency of industry's perspective	√		√	
		Full commensurate and transparency of industry's mission	√		√	
2	Recognizing the strategic requirements of the industry	Implementing a clear strategy in industry		√	√	
		Right conception of organizational perspective, mission and values of the organization	√		√	
		Transparency and clarity of industry's strategic goals	√		√	
		The culture of accepting BSC in organization		√	√	
		Consistency of BSC executive goals with organizational strategy			√	√
		The existence of managerial system in BSC implementation process		√		√
3	The capability and readiness to accept implementation	The existence of training facilities for BSC				
		The existence of software/hardware infrastructures	√		√	
		Budget to implement BSC	√		√	
4	Senior management commitment	Senior management support and commitment to implement BSC	√		√	
		Establishing strategic committee to conduct BSC and feedback giving	√		√	
		An awarding system based on the results of BSC evaluation		√	√	
		Transparency in BSC - related information		√	√	
5	Proportionate manpower structure	Providing real reports	√		√	
		Contribution of all organizational members in implementation process		√	√	
		People's awareness of their roles and effects on BSC implementation	√		√	
6	Objective execution of BSC system	Executing BSC in all organizational levels		√	√	
		BSC implementation as a continuance process		√	√	
		The existence of strategy reflecting indicators for BSC		√		
		Updating BSC current data and information regularly				
		Recognizing BSC implementation roadmap		√	√	
7	Financial indicators	Defining financial indicators		√	√	
		Realization of financial indicators	√		√	
8	Customers' indicators	Defining customers' indicators	√	√	√	
		Realization of customers' indicators		√	√	
9	Internal processes indicators	Defining internal process indicators	√	√	√	
		Realization of internal process indicators		√	√	
10	Growth and learning indicators	Defining growth and learning indicators	√	√	√	
		Realization of growth and learning indicators		√	√	

Recognized affecting sub factors from Delphi method based on research literature are categorized in 10 main factors. These ten factors were weighted by AHP and outlined in table 2.

**Table 2.**Weights of main factors

Main factor	Weight	Main factor	Weight
<b>Objective execution of BSC system</b>	0/092	Mission, perspective and values of the industry	0/09
<b>Financial indicators</b>	0/103	Recognizing the strategic requirements of the industry	0/098
<b>Customers 'indicators</b>	0/11	The capability and readiness to accept implementation	0/099
<b>Internal processes indicators</b>	0/102	Senior management commitment	0/12
<b>Growth and learning indicators</b>	0/098	Proportionate manpower structure	0/087

Acquired weights from main factors of AHP were used for final ranking sub- factors of TOPSIS process. TOPSIS calculations are shown in table 3.

**Table 3.** TOPSIS calculation

Sub-factor	Ci	Sub-factor	Ci
<b>Full commensurate and transparency of industry's perspective</b>	0/605812	Contribution of all organizational members in implementation process	0/551731
<b>The existence of managerial system in BSC implementation process</b>	0/633827	Executing BSC in all organizational levels	0/609722
<b>Implementing a clear strategy in industry</b>	0/797837	Providing real reports	0/514263
<b>Right conception of organizational perspective, mission and values of the organization</b>	0/709343	The existence of strategy reflecting indicators for BSC	0/922636
<b>Transparency and clarity of industry's strategic goals</b>	0/898179	People's awareness of their roles and effects on BSC implementation	0/602998
<b>Establishing strategic committee to conduct BSC and feedback giving</b>	0/518834	Defining internal process indicators	0/514009
<b>Consistency of BSC executive goals with organizational strategy</b>	0/857976	Defining financial indicators	0/533824
<b>Full commensurate and transparency of industry's mission</b>	0/539601	Defining customers' indicators	0/680484
<b>Transparency in BSC - related information</b>	0/4592	Realization of customers' indicators	0/655584
<b>Budget to implement BSC</b>	0/531485	Defining growth and learning indicators	0/56081
<b>Senior management support and commitment to implement BSC</b>	0/856554	Realization of growth and learning indicators	0/482428
<b>The existence of software/hardware infrastructures</b>	0/511636	Realization of financial indicators	0/494962
<b>An awarding system based on the results of BSC evaluation</b>	0/841216	Realization of internal process indicators	0/408737
<b>The culture of accepting BSC in organization</b>	0/695429	Recognizing BSC implementation roadmap	0/706219
		BSC implementation as a continuance process	0/678135

TOPSIS method is used to ranking factors as shown in table 4.

**Table4.** TOPSIS calculation

Main factor	Ci	Main factor	Ci
<b>Recognizing the strategic requirements of the industry</b>	0/9354	The capability and readiness to accept implementa	0/4820
<b>Senior management commitment</b>	0/7753	Growth and learning indicators	0/4770
<b>Objective execution of BSC system</b>	0/6626	Proportionate manpower structure	0/4710
<b>Customers' indicators</b>	0/6487	Financial indicators	0/4560
<b>Mission, perspective and values of the industry</b>	0/5167	Internal processes indicators	0/4380

### Finding and Discussion

Finally, main influencing sub- factors were ranked and outlined in table 5.

**Table5.** Ranking of sub factors

Sub-factor	Rank	Sub-factor	Rank
People's awareness of their roles and effects on BSC implementation	16	The existence of strategy reflecting indicators for BSC	1
Budget to implement BSC	17	Consistency of BSC executive goals with organizational strategy	2
Full commensurate and transparency of industry's perspective	18	Transparency and clarity of industry's strategic goals	3
Defining growth and learning indicators	19	An awarding system based on the results of BSC evaluation	4
Contribution of all organizational members in implementation process	20	Right conception of organizational perspective, mission and values of the organization	5
Transparency and clarity of industry's strategic goals	21	Senior management support and commitment to implement BSC	6
Defining financial indicators	22	Recognizing BSC implementation roadmap	7
Realization of internal process indicators	23	Implementing a clear strategy in industry	8
Transparency in BSC – related information	24	The culture of accepting BSC in organization	9
Providing real reports	25	BSC implementation as a continuance process	10
Realization of financial indicators	26	The existence of managerial system in BSC implementation process	11
Realization of growth and learning indicators	27	Defining customers' indicators	12
The existence of software/hardware infrastructures	28	Realization of customers' indicators	13
Realization of internal process indicators	29	Establishing strategic committee to conduct BSC and feedback giving	14
		Executing BSC in all organizational levels	15

Eventually, 10 main factors are pointed out within table 6.

**Table 6.**Ranking of main factors

Main factor	Rate	Main factor	Rate
The capability and readiness to accept implementation	6	Recognizing the strategic requirements of the industry	1
Growth and learning indicators	7	Senior management commitment	2
Proportionate manpower structure	8	Objective execution of BSC system	3
Financial indicators	9	Customers 'indicators	4
Internal processes indicators	10	Mission, perspective and values of the industry	5

95% of organizational staff doesn't understand strategy (Niven, 2007: 25). In present study, rank one belongs to strategic factors which indicate its significance in implementing balanced scorecard. In value generation period of physical assets when employees were like organizational bolts and nuts, such situation made no problem while in knowledge age generated by intangible assets, employees' awareness, relations and culture is a part of value generation process in organization. Balanced evaluation through translating organizational strategy to goals, measures, qualitative goals and executive plans have caused a joint understanding and the extension of the strategy in the organization. Balanced evaluation would convert a hard and complex word like perspective to tangible and executive terms. Only 25% of administrators find their interests intertwined with strategy (Niven, 2007: 24). Often, service compensation systems pay award to the realization of short term goals rather than strategies. Balances evaluation links awards directly to value generating areas through implementation evaluation measures in organizational body. 85% of administrators discuss on strategy less than 1 hour per month. While senior administrators should spend their time on understanding value generating and destroying mechanisms, they are often busy with analyzing budget contradictions (Niven, 2007: 26). In present study, senior management

commitment ranked the second that indicates the significant of top management and its commitment in BSC implementation.

### Conclusion

By employing balanced scorecard evaluation, administrators would look closely at to effective elements in recognizing organizational strategy. Balanced scorecard evaluation delivers administrators having information more than financial results by using an integrated set of measures. Based on results, it is proposed to look closely at these factors mentioned conceptual framework when implementing balances scorecard system and assure their appropriate implementation. By considering factors that are more significant as compared to other ones, organization administrators should consider their significance in allocating resources to implement them first of all.

### Recommendations and Suggestions

Managerial recommendation:

- Establishing a strategic committee to assure BSC conduct and getting feedback to remove weaknesses and to continue strengths for optimizing BSC implementation
- Developing an executive assurance by adopting a series of laws and regulations such as laws on awarding process.
- Since BSC is a method to convert strategy to practice, one should pay precise attention to that fact that consistency of organizational goals with strategy is more significant that strategy formulation
- Guidelines on culture developing to accept BSC (attempts that organization staff view BSC as a value)
- Establishing a separated unit to implement BSC which pursues plans, responsibilities and aims of BSC and, as a result, BSC will be executed as continuous process
- Developing a mechanized reporting system to avoid unreal reports
- Developing an effective communicational system which facilitates people's contribution in all levels and helps people's awareness on their role in BSC implementation
- Planning training courses to implement BSC which can be toward culture building and toward executing and understanding BSC

Future researches can distinguish vital factors in evaluating BSC performance through considering recognized influencing factors in present study; also can compare recognized affecting factors in BSC effective implementation in various companies. Figure out organizational achievement in BSC effective implementation.

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