Incubators Performance Measurement by means of Balanced Scorecard: A New Trend in Innovation Evaluation

Masoomeh Maddah, Sara Safari
Rooyesh IT Incubator - Iran

Abstract

Along with formation of incubators and science and technology parks, by direct support of ministry of Science, Research and Technology, ministry of Industries and Mines, ministry of Industrial Development and Renovation, Governors of Iran decided to develop the incubators; this resulted in establishment of more than 40 incubators, with technical fields of activity. One of the outstanding subjects regarding these incubators, with more than five years of activity, is that there has not yet been any studies and researches on incubators performance measurement, therefore this makes the judgment on effectiveness of performances quite complicated and difficult.

In this paper, the authors have tried to provide a method which is adaptable with the features of these incubators for management and evaluation of them.

The model used in this article is the "Balanced Scorecard"(BSC).By considering and focusing on different aspects of this model which are: "Financial(or Shareholders)", "Customers(Tenants)", "Processes for service delivering in incubators" and "Growth and Learning", first the effective criteria for performance measurement were specified, then by means of TOPSIS1 method, a new trend for incubators -as non-profit governmental organizations- measurement was introduced.

Keywords: Performance Measurement, Incubators, BSC Model, TOPSIS

1. Introduction

Incubators Performance Measurement deals with the implementation of the strategies that the incubators carry out. When based on the use of a balanced Scorecard, it can produce tools that identify and control critical factors on the road to success. The main rationale for measuring performance of incubators is to be able to manage them effectively. Performance measurement of incubators translates their strategies into concrete objectives; communicates the objectives to employees; guides and focuses employees' efforts towards achieving these objectives; controls whether or not the strategic objectives are reached; uses double-loop learning to challenge the validity of the strategy itself, and visualizes how individual employee's efforts contribute to the overall business objectives [1]

Performance measurement is usually carried out using a performance measurement system, which consists of several individual measures. There are many frameworks for constructing such a system. The measures for the performance measurement system are chosen based on a vision and strategy. The aim is to measure success factors from different perspectives, like customers (tenants), employees, business processes and financial success, as well as from the perspective of past, current and future performance. In this way, different aspects of performance can be measured and managed [2].Evaluations of business incubators in Europe and the U.S. suggest that 90% of incubated startups were active and growing after three years of operation, which is a much higher success rate than that observed in startups launched without assistance.

---

1 . Technique for Order-Preference by Similarity to Ideal Solution

2. Definitions

2.1. Balanced Scorecard

In 1992, Robert S. Kaplan and David Norton introduced the balanced Scorecard (BSC), a concept for measuring a company's activities in terms of its vision and strategies. It gives managers a comprehensive view of the performance of a business.

It is a strategic management system that forces managers to focus on the important performance metrics that drive success. It balances a financial perspective with customer, internal process, and learning & growth perspectives. The system consists of four processes:

1. Translating the vision into operational goals;
2. Communicating the vision and linking it to individual performance;
3. Business planning;
4. Feedback and learning and adjusting the strategy accordingly[3].

2.2. Incubators

Incubators are organizations that support the entrepreneurial process, helping to increase survival rates for innovative startup companies. Only entrepreneurs with feasible projects are admitted into the incubators, where they are offered a specialized menu of support resources and services. The resources and services open to an entrepreneur include: provision of physical space, management coaching, help in making an effective business plan, administrative services, technical support, business networking, advice on intellectual property and sources of financing [4].

In essence, incubators are consulting firms that are specialized in new firm creation. In the last twenty years, many developed and developing countries have started large systems of public business incubators to encourage and assist entrepreneurship. In many cases, public incubators are designed to stimulate the development of new products and services in high-tech industries. For science-based business incubators, an effective collaboration with universities and research institutions is essential to motivate researchers into taking the risk of initiating a company [4].

3. Existing Models for Performance Measurement

There are several models for performance measurement, two of the main ones are: EFQM2 Excellence Model, and Balanced Scorecard.

The specific purpose of the EFQM Excellence Model is to provide a systems perspective for understanding performance management. The Excellence Model is a non-prescriptive framework based on nine criteria reflecting validated, leading edge management practices. With their acceptance nationally and internationally as the model for performance excellence, the criteria represent a common language for communicating and sharing best practices among organizations. Five of the criteria cover what an organization can manipulate, called ''Enablers''; while the other four represent what an organization will achieve, named ''Results''[5].

As stated previously, the main reason for selecting the BSC Model for incubators performance measurement, in comparison with the EFQM Excellence Model, is that, the BSC Model concentrates more on learning and growth aspect, and believes that this aspect is the mainstay of all other aspects.

Furthermore, it contains outcome measures and the performance drivers of outcomes. One of the reasons the BSC is such a powerful tool is precisely that it stresses the linkages for achieving outstanding performance in related measures, rather than concentrating on isolated measures. As Hepworth (1998) puts it, "the added value of the balanced Scorecard is in the drawing together of all the key business areas and identifying the linkages that deliver success'' . Thus, the scorecard helps to fight sub optimization by forcing managers to consider all key measures that collectively are critical for the success of the organization and highlighting the need to analyze trade-offs. The measurement

---

2 . European Foundation for Quality Management

system should then make the relationships among objectives (and measures) in the various perspectives explicit so that they can be managed and validated.[5]

Since the mission and objectives of incubators and present age paradigms put a great emphasis on "Learning Organizations", the BSC Model with its specific focus on "Learning and growth"- as one of its main aspects- can best meet the incubators performance measurement needs.

4. Different Perspectives of Balanced Score Model

The Balanced Scorecard allows managers to look at the business from four important perspectives, thus constituting a holistic view of the organization (see Fig. 1). It provides answers to four basic questions as follows: [6]

1. Can we continue to improve and create value? (Innovation and learning perspective.)
2. What must we excel at? (Internal perspective.)
3. How do customers see us? (Customer perspective.
4. How do we look to shareholders? (Financial perspective)[7].

4.1. Learning and Innovation

Organizational success, over the long term, requires innovation, learning and growth that are expressed in the development of people and infrastructure. These elements create the foundation for future organizational success and add robustness to an organization's strategy. [8]

4.2. Internal perspective

The processes that create value for an organization's clients drive its performance. To respond to external opportunities or needs, organizations align their internal activities to create the appropriate response. The ability to perform the right activities and successfully link processes to transform various inputs into valuable outputs (an organization's value chain) is vital for organizational success [9].
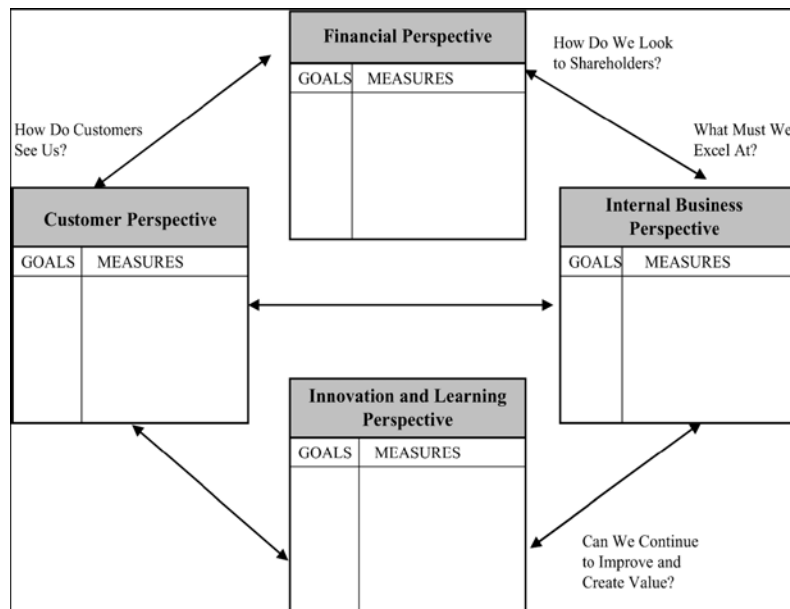

Figure1. The Balanced Scorecard links performance measures

4.3. Customer perspective

Organizations serve a target group and whether the individuals are called customers, clients, citizens, stakeholders, or something else, their perceptions of the value created by the organization matters. Each of the preceding names carries the nuance of a particular kind of relationship. In all cases, understanding and responding to the particular expectations of those involved is essential in securing a viable and beneficial relationship [10].

4.4. Financial Perspective

The ultimate measure of a private sector company's success is its financial success. Organizations in the public and voluntary sectors do not have the same elegant "bottom line" measure that exists for profit-seeking enterprises. Regardless of sector, many traditional instruments of management control are found in the financial perspective [11].

The specific measures within each of the perspectives will be chosen to reflect the drivers of the particular business. The method can facilitate the separation of strategic policymaking from the implementation, so that organizational objectives can be broken into task oriented objectives which can be managed by front-line staff.

5. The Derived Criteria for Incubators Performance Measurement

For deriving the measurement criteria, we considered that the incubators be categorized according to their missions (their fields of activity) and the regions in which they exist.

The purpose was that, the incubators with the same mission, be in one category, because the plans of the incubators that admit the start-up companies differ from those who have spin-off and

R & D units; and these two are not comparable with each other.

Before implementing the BSC Model, since the effective criteria for incubators performance measurement is independent from the model used in this article, the criteria were derived to be used in the framework of BSC for incubators performance measurement.

The effective criteria in incubators performance, according to personnel indices, organizational structure, performance and deliverable services, were specified. Then, by collecting the experts' opinions and combination of some proposed criteria, 37 criteria were prioritized and weighed afterwards, and then 21 criteria which had the highest ranks were finalized to be reflected in the proposed framework.

6. Depiction of Performance Measurement Criteria in BSC Model

As it was mentioned before, the framework used for implementing the criteria, is the BSC Model.

For depicting the performance measurement criteria in the BSC Model, the strategic objectives of the incubators were categorized within the financial, customer, internal business processes and learning perspectives.

The incubators performance measurement criteria are according to the four main perspectives of this model, and the 21 derived criteria. Following is the table of derived criteria (table 1).

Perspective	Criterion
Internal business processes	Obeying the approved criteria within the regulations of incubators
	Active involvement of Technology incubators committee
	Coordination between admission of technology units and approved policies- from number and field of activity perspectives.
	The flexibility of deliverable services to technology units
	The proper environment allocated to each unit
	The proper distribution of incubator's environment
Learning and growth	Utilizing the knowledge and experience of graduated SMEs for delivering services to the resident tenants of incubator
	The educational level of the managerial team and experts of incubator
	Suitable training system that can best meet the needs of personnel and experts of the center
	The executive background and track records of managerial team and experts of the incubator
	Effective relationship with industries, universities, research centers and technology parks
Customer	The number of admitted (accommodated) technology units
	The success of the units in improving their core idea, (the technological achievements in forms of product and services)
	The existence of technologic units with complementary fields of activities
	The cooperation rate and the common projects undertaken by units
	The satisfaction level of resident tenants from the received services
Financial	Vitrification of credit allocation and received credits
	effective relationships to attract credits
	The suitability of support services rentals
	Existence of suitable tariffs for technical services (consultancy + training)
	The coordination between financial objectives of the financial regulations of incubator with approved regulations of the ministry

Table1. Derived Criteria for Incubators Performance Measurement

7. Prioritizing the Incubators by means of TOPSIS Method

The Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS) method was developed by Hwang and Yoon [4] for solving MCDM3 problems with a finite number of solutions. The TOPSIS method establishes that the chosen solution should have the shortest

distance to the positive ideal solution and the longest distance from the negative ideal solution , where the distances are calculated with a particular value of p $(1 \leq p \leq \infty)$.

The inputs of this method involves: Decision making Matrix and Weight Axis. For evaluating and prioritizing the incubators within Iran, we considered the objective as selecting the best incubator among all existing incubators. By considering the fact that, the quality of an incubator originates from evaluation of four criteria and 21 sub-criteria. Then the hierarchical diagram was developed. For each row, the Bi-Comparison Matrix would be made and when, the

Bi-comparisons and judgments were made, the weights would be

---

3 . Multiple Criteria Decision making

calculated. If the Matrix was consistence, we will move to next step and the weight of elements in the last level(**problem attributes: Incubators**), would be compared with elements in the previous level. Then, the TOPSIS Solution Algorithm for incubators prioritization will be explained.

Step 1: Converting the existing decision making matrix to a normalized matrix by using the following formula:

$$n_{ij} = \frac{r_{ij}}{\sqrt{\sum_{i=1}^{m} r_{ji}^2}}$$

Step 2: Establishing a weighty normalized matrix by using $W = \{w_1, w_2, ..., w_n\}$:

Weighty normalized matrix: $V = N_D . W_{n \times n}$
Which:
ND: A matrix containing normalized & comparable score criteria.
Wn.n: A diagonal matrix.

Step 3: Gaining positive ideal solutions (A^+) & negatives (A^-) for each criteria as follows:

$$A^+ = \{(\max_i v_{ij} | j \in J), (\min_i v_{ij} | j \in J') | i = 1,2,...,m\} = \{v_1^+, v_2^+, ..., v_n^+\}$$

$$A^- = \{(\min_i v_{ij} | j \in J), (\max_i v_{ij} | j \in J') | i = 1,2,...,m\} = \{v_1^-, v_2^-, ..., v_n^-\}$$

$$J = \{1,2,...,n| \text{ Related to income}\}$$

$$J' = \{1,2,...,n| \text{ Related to cost}\}$$

Step 4: Calculating Separation Measures(SM). Each attribute's(incubator's) SM is derived from Euclidean's N dimensional distance. Each ideal solution's SM calculates on:

$$d_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2} \qquad i = 1,2,...,m$$

And in the same way, negative ideal solution's SM calculates on:

$$d_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2} \qquad i = 1,2,...,m$$

Step 5: Calculating Relative Closeness of each attribute to ideal solution. Relative Closeness is defined as:

$$cl_i^+ = \frac{d_i^-}{(d_i^- + d_i^+)} \qquad i = 1,2,...,m$$

As you see, if $A_i = A^+$ then $d_i^+ = 0$ so then $cl_h^+ = 1$
And if $A_i = A^-$ then $d_i^- = 0$ so then $cl_i^+ = 0$
Thus the closer A_i to the ideal solution (A^+), the closer the value of cl_i^+ to 1.

Step 6: By using the prioritized attributes, based on declining sequence of cl_i^+, available attributes of problem can be prioritized; So the attribute(incubator)which has the most relative closeness, would enhance the first rank.

8. Conclusion

In this article, based on the Balanced Scorecard (BSC) Model, the effective criteria for Incubators Performance Measurement was derived; and among different Multiple Attribute Decision Making (MADM) Methods, TOPSIS Method was chosen for prioritization of Incubators Performance, because of the theoretical and practical strengths that it embodied.

9. Acknowledgements

References

1. Jungman, Hannu, Okkonen, Jussi, Rasila, Tommi, Seppä, Marko, "Use of Performance Measurement in V2C Activity", Benchmarking: An International Journal (BIJ), Vol. 11, Issue 2, 175-189, 2004.

2. [2] Kaplan, Robert & Norton, David, "Using the Balanced Scorecard as a strategic management system",Harvard Business Review, 2001.

3. [3] Kaplan,Robert & Norton,David, "Transforming balanced Scorecard, from performance measurement to strategic management, Harvard Business Review, 1996.

4. [4] Maddah, Masoumeh, "Developing the Information Technology Incubators Strategy", MSc Thesis, 2004, with guidance of Doctor Ali Ahmadi, Imam Hosein University, Tehran.

5. [5] Wongrassamee S., Gardiner P.D., Simmons J.E.L., "Performance measurement tools :the Balanced Scorecard and the EFQM Excellence Model", Measuring Excellence, P.14, Vol. 7, No. 1, 2003.

6. [6] Kaplan,Robert & Norton,David, 2000, "the Balanced Scorecard: Measures That Drive Performance", Harvard Business Review, January-February1992.

7. [7] Gopal, K. Kanji & PatrÂicia, Moura e SaÂ, "Kanji's Business Scorecard".

8. [8] Kaplan, R.S. and Norton, D.P., ''Putting the Balanced Scorecard to work'', Harvard Business Review, September-October, pp. 134-42,1993.

9. [9] Kaplan, R.S. and Norton, D.P., "The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment", Harvard Business School Press, Boston, MA, 2000.

10. [10] Brown, M. () "Is your measurement system well balanced?", The Journal for Quality and Participation, 17, pp. 6-11, 1994.

11. [11] Maskell, B.H, Performance Measurement for World Class Manufacturing: A Model for American Companies, Productivity Press, Cambridge, MA., 1992.