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A Comprehensive Model for Status Assessments' Gap Evaluation in the World Class Manufacturing -- Based on Modifications' Development of ESCAP Approach

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Abstract
In this paper we generalize and develop a comprehensive model upon which we can determine the position of and gap in the world class manufacturing processes. This paper is based on the belief that for evaluation of world class manufacturing processes, we can use determination of gap in world class manufacturing processes, generalized from ESCAP (United Nations Economic and Social Commission for Asia and the Pacific). In order to achieve the above objective, and to determine the total position and gap in question, ESCAP model was used to generate a formula called Situation Contribution Coefficient (SCC) for Manufacturing Position at the global level.

Key words: Manufacturing processes; Determining the position of world class processes; ESCAP model

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INTRODUCTION
Rapid changes and requirements of human in today's world entail a global cooperation. For this cooperation one needs to be aware of its conditions and governing regulations.

The dominating attitude in the area of manufacturing is that of Manufacturing at the global level based on absolute competitive advantage. The World Class Manufacturing (WCM) approach is based on absolute competitive advantage and can be defined as best practice. WCM equals successful competition and gaining profits in an international competitive environment. In this article for determining the position of manufacturing processes at the world class and its relevant gap, and because of lack of a model for measuring WCM level, the ESCAP model, which is usually used for evaluating technologies against best practice at the global level, was generalized for this purpose (Sharif, 1983). This model measures all the important factors of success for achieving WCM which can be called the contribution for achieving WCM and a coefficient called Situation Contribution Coefficient can be defined for it.

WORLD CLASS MANUFACTURING
Globalization will influence the world's future in the 21st century. The global strategy is a program for offering goods effectively at the global level, but the result is not just success but existence and survival (Akhter, 1995; Keegan, 2002).

WCM can be defined as best practice and can be used to describe best manufacturers in the world (Todd, 1995).

Different authors like Hise, Weel Right, Edosomwan, Harrison, Schonberger, Burcher, Motwani, Todd, Stone,

Ng, & Hung have mentioned the characteristics of an organization with WCM as: improved profitability, training, designing products, best quality, rapid reaction against competitors, manufacturing programs, paying attention to customers' needs, reasonable prices, due delivery, flexibility, quality management, reducing goods supply, production cost, innovation, strategy, systems and structures, accountability, measuring performance, key values and goals, culture, and competitors (Edosomwan, 1996; Burcher & Stevens, 1996; Ng & Hung, 2001; Schonberger, 1996; Gunasekaram, 2000).

Many researchers have proposed the following production characteristics for WCM:

Emphasizing strategic thinking instead of short term profitability, dominating systematic thinking in global competition components (such as quality, cost, and flexibility), customer-centered attitude, better performance in comparison with other competitors or at least in one competition aspect, better competitive profitability in comparison with other competitors, rapid reaction against changes, emphasizing training and developing human forces, cooperation culture, omission of unnecessary parts, creation of a good information system, the quality-centered culture, innovation, self control workers, establishing efficient maintenance and fixing system (Harrison, 1998; Kinni, 1996; Todd, 1995; Shunta, 1995; Shores, 1994; Schonberger, 1987; Vanderspek, 1993).

Different models in the area of WCM have been proposed (like Schonberger, 1987; Farish, 1995; Gilgeous, 1999; Motwani, Kumar & Kathawale, 1994; Ng & Hung, 2001; Shunta, 1995; Ali Askari, 2004; Ross, 1991; Seyed Hosseinie, Mosleh Shirazi, Toloie Eshlaghy & Mehran, 2012) each of which has proposed measures necessary for the establishment of WCM.

WCM includes successful competition and profitability in a competitive international environment. Among important duties of industries are: becoming a successful manufacturer at the global level, recognizing the commercial environment with free competition, threats, opportunities, and competitive advantages; as well as industrial planning and manufacturing for preparing and remaining in this environment.

One of the issues on the (World Class Manufacturing) which considered by various researchers is how to measure production process at global level, such as in Maskell, Burcher & Stevens, Kaplan & Norton, Browne, Devlin, Rolstadas & Andersen studies and cited.

Any of these researchers attempted to design some models and criteria in this regard. Maskell (1991), Burcher and Stevens (1996), Kaplan and Norton (1992), Browne, Devlin, Rolstadas and Andersen (1991) consider this existed gap and capabilities of the paper to fill some parts of this gap, in this paper attempted to present a clear and applicable model to determine production process state in global level.

GENERALIZED ESCAP FOR GAP EVALUATION

In this study, for determining the position of manufacturing processes at the world class and its relevant gap, the ESCAP (United Nations Economic and Social Commission for Asia and the Pacific) model, which is usually used for evaluating technologies against best practice at the global level (Sharif, 1983; Mehran, 1995; Esfahani,1991; Forghani, 1993; Fahimi, 1991; Goodarzi, 1991; Vafamehr & Sheikholeslami, 1991; Ministry of Planning and Budget, 1989) was generalized for this purpose (generalizable to all industrial, commercial and service activities). For this purpose, a formula called Situation Contribution Coefficient for World Class Manufacturing was developed.

Situation Contribution Coefficient (SCC)

World Class Manufacturing (WCM)

This proposed model measures all the important factors of success for achieving WCM which can be called the contribution for achieving WCM and a coefficient called Situation Contribution Coefficient can be defined for it. It defines the contribution of each factor in achieving WCM as follows:

$$SCCWCM = X^{BX} \quad (1)$$

where X is the score for the contribution of each factor and B is their weight or intensity which shows the intensity of the contribution of each factor in SCCWCM scale.

According to the following information the position of manufacturing processes at the world class in comparison with other competitors and its relevant gap can be calculated:

1. Calculating the mean of positions for the factors under analysis.

2. Calculating the contribution of each factor using the following normalization formula:

The role contribution of each factor = (1/9){The lower level +(1/10(The mean of factor position(The upper level – The lower level)))} (2)

Up to this stage three kinds of scores are generated which include lower and upper levels and the position of the industrial factor under consideration in comparison with the best unit available in the world level. Now if we integrate these three scores using formula (2), the normalized contribution of each key factor is obtained.

3. Calculating the intensity of contribution for each factor.

For calculating the intensity of contribution, the key factors under analysis are ranked in order of importance for the industry, and then compared with each other.next، They are ordered in a matrix form, which is solved using binary comparison methods (like Analytical Hierarchy Process (AHP)) (Saaty, 1980) along with Eigen Value analysis.

The calculated Eigen Value in the above matrix shows that if one of the components is higher than the other, the components for its Eigenvector are also higher. In other words, the importance of one component is relative to the other; therefore, we can measure the importance of each component through Eigenvector.

4. Calculating the Situation Contribution Coefficient for determining the total level of factor positions relative to World Class Management.

Formula (1) is used to calculate the Situation Contribution Coefficient.

Thus, through exponentiation of the above coefficients in the normalized figures for each factor and multiplying all key factors, the total level of WCM position and its gap can be calculated. It is worthy to note that this formula is a power function and before using it for values in (1), they should be changed into a zero to one scale.

CONCLUSIONS

In today's Markets which is full of competition, knowing about one's position relative to WCM processes is essential. Without this kind of information, competition and even survival to maintain activities is difficult and sometimes impossible. Nowadays achieving the position of world class manufacturing is among organizations' strategic goals.

As there have not been enough models and approaches analyzed for determining the position of WCM processes, this article aims at generalizing ESCAP (United Nations Economic and Social Commission for Asia and the Pacific) model for this purpose.

Through generalizing ESCAP model, we can calculate the position of WCM processes. Moreover, we can determine the strengh and weaknesse and the gaps in the industry and choose a strategy for allocating the most effective factors to manufacturing processes to achieve WCM.

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