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Analyzing the factors influencing the emergence of India as world's manufacturing hub

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ABSTRACT
This short article addresses several prevailing issues evolving from the growth of Indian industries and portrays the prospective of India to be transformed into World's manufacturing hub. Thereafter several criteria and sub-criteria are identified which are crucial in this regard. In order to understand the scope of India to turn out to be the potential manufacturing hub, a relative and comparative analysis has been carried out using a Multi Criteria Decision Analysis tool namely Analytic Hierarchy Process (AHP). The result obtained, demonstrates that India is an automatic choice as the hub of manufacturing, since all the important resources are available in abundance.

Introduction

The Indian manufacturing segment has navigated through a varying path to industrial advancement over the past six decades. Since early 1980s, this segment has passed across substantial changes through a range of reorganizations. In conjunction with China, India is budding as World's manufacturing hub promptly. Manufacturing segment has a significant functionality in national economy in granting employment. The primary grounds of its growth are availability of skilled labor at low rate, investment in the public domain, declining government imposed rules, and growing interest of private institutions in investment. In terms of manufacturing expertise, India stood in 2nd position (Global Manufacturing Competitiveness Index 2010, developed by the Deloitte Touche-Tohmatsu and the US Council on Competitiveness (Bhandari et al., 2010).

Since early 1990s various reformations took place such as reduction in number of publicly owned enterprises, growing tendencies of international firms to be established nationwide, introduction of deregulation in SME units. These activities are the root cause of the enhanced productivity and efficacy in Indian industrial scenario.

The competitive environment and technology innovation help enhancing the productivity and reduce the cost of production immensely (Mani, 2008).

Innovation in manufacturing is crucial, thus technologically intensive manufacturing in India would be significant along with the manpower availability.

Road connectivity and power generation are two important factors in manufacturing. Technical and non-technical skills are also substantially important to improve the technical efficacy of the firms.

The technical efficacy of a firm is defined as the optimized means by which the firm utilizes its primitive resources which is believed to be a significant factor of productivity and global competitiveness (Taymaz & Saatci, 1997).

Technical efficacy consists of enhancing the quality and volume of production utilizing fixed blend of factors. For the Indian industrial scenario, various researchers tested the technical efficacy of the manufacturing firms, such as Agarwal (2001), and Mitra, Varoudakis, and Veganzones-Varoudakis (2002), Bhandari and Maiti (2007). The Indian government's assurance to elevate its investment in infrastructure from nearly 7% to 9% shows the opportunity for the growth within India's manufacturing sector. A number of foreign manufacturers has considered India as an export hub. Hyundai has established its small car manufacturing base in India, Nokia's mobile handset manufacturing unit has been established in Tamil Nadu which was cost effective than China.

Indian domestic market is substantially large, with over 600 million rural consumers, which is also a crucial factor for the stated matter. Labor wages in India are believed to be lesser than other countries, and half of those in China.

Latin America, Africa and other part of Asia represent 11% of Indian export market, which is assumed to be increased in near future. India is advantageous in terms of technology-intensive manufacturing. An example of Tata Nano car would be appropriate in this context. The state governments initiative to build up manufacturing zones could be attractive to automobile and other manufacturers.

Ahp Analysis

In order to analyze the Indian prospects to emerge as a manufacturing hub, various criteria are considered in this study. Analytic Hierarchy Process (AHP) is utilized to evaluate these criteria and to find which of these are the most crucial from Indian perspective. Authors have prepared the questionnaires based on the information gathered from the professionals of the industry and media. On the basis of the experts opinion the AHP analysis has been carried out.

The AHP is a multi criteria decision analysis technique that exploits hierarchical relationships to represent a problem. Primacies for substitutes are acquired based on the opinion of the experts (Saaty, 1980). The method consists of several

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important steps: outlining the problem into shape, obtaining the hierarchical relationships, forming pairwise comparison matrix, approximating the relative weights, examining the consistency and finally attaining the overall ranking. The method is stated as,

Step 1: The hierarchical relationship of the problem can be obtained and presented in Figure 1. The proposed AHP method decomposes the problem into several levels: the first level demonstrates the main objective, the selection of main factor, the second level depicts all the factors the third level depicts the sub factors.

Step 2: Calculation of the pairwise comparison matrix for each level is required. For the pairwise comparison, a ranking scale is used for the criteria evaluation, ranging from 1 to 9 (Saaty, 1980). The pairwise comparison matrix for all the criteria is presented in Table 1. The comparison matrices of sub-criteria are presented in Table 2, Table 3 and Table 4.

Step 3: On the basis of the comparison matrix, the consistency index and consistency ratio is calculated using equations (1-3), which finally produce the composite scores to each of the criteria.

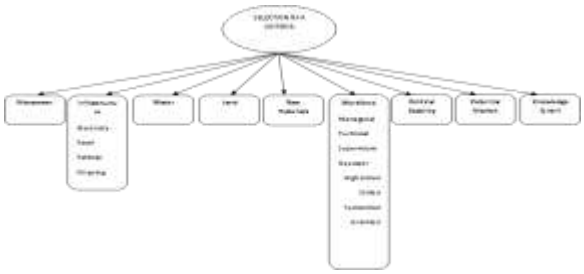

Figure 1. Hierarchical diagram of criteria and sub-criteria

The consistency index (*CI*) of pairwise comparison matrix is calculated using,

$$CI = \frac{\lambda_{max} - n}{n - 1} \qquad (1)$$

and the random consistency index (*RI*) is computed as,

$$RI = 1.98\frac{n-2}{n} \qquad (2)$$

where λ_{max} is the maximum eigenvalue and n is the size of pairwise comparison matrix. Thus the consistency ratio (*CR*) is obtained using,

$$CR = \frac{CI}{RI} \qquad (3)$$

In general CR value is achieved to be < 0.1. Table 5 provides the information about the CI and CR for all the pairwise comparison matrices which settles all the CR values < 0.1 therefore the computed results are acceptable.

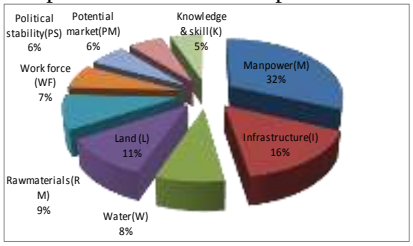

Figure 2. weights of different criteria

Discussion

Figure 2 presents the pictorial view of the relative importance of the criteria to establish manufacturing unit in India. It states manpower availability is the most important issue. According to Bhandari et al. (2010) India has huge manpower availability due to its large population size.

India has substantially qualified technologists and wage rate is also low in India than other countries. India boasts of 100 million hard working English speaking people.

Most of the Indian firms spend less in acquiring highly productive and cutting-edge machineries and equipments and utilize human skills in existing semi-automatic, general machines. The productivity is assumed to be less, but the cost of production is equally less in such case.

Therefore the result obtained by this analysis supports the past literature. Next most important criteria are infrastructure and land. Infrastructure is an important issue in Indian context and Indian Government has initiated investment in infrastructure development as stated earlier. India has plenty of lands which are not actually agricultural lands and available in reasonable price.

Therefore it can be stated that the most important criteria to build up manufacturing units are available in India which further support the statement '*India As World's Manufacturing Hub*'.

Conclusion

This article presents the scope of India to emerge as global manufacturing hub. It also analyzes various criteria and sub-criteria which are the most important factors to set up manufacturing units.

An AHP based analysis is carried out which depicts that manpower, infrastructure and land are the most important criteria in Indian context.

The past literature also demonstrate the similar findings, which further state, as a developing nation India is improving its infrastructure and due to the easily available labor and land, India is proved to be the World's manufacturing hub in recent future.

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Table 1. Comparison Matrix Of Main Attributes

	M	I	W	L	RM	WF	PS	PM	K	Weights
Manpower available (M)	1	5	4	3	4	3	4	3	7	0.315286
Infrastructure (I)	1/5	1	3	3	2	3	3	2	2	0.159484
Water (W)	¼	1/3	1	1	2	1	1	2	1	0.0813317
Land (L)	1/3	1/3	1	1	3	3	1	2	1	0.106932
Raw materials (RM)	¼	½	½	1/3	1	3	3	2	2	0.0945877
Work force (WF)	1/3	1/3	1	1/3	1/3	1	2	2	1	0.0671917
Political stability (PS)	¼	1/3	1	1	1/3	½	1	1	2	0.061677
Potential market (PM)	1/3	½	½	½	½	½	1	1	2	0.0591182
Knowledge & skill (K)	1/7	1/2	1	1	½	1	1/2	1/2	1	0.0543925

Table 2. Comparison Matrix Of sub-criteria of Infrastructure

	Electricity	Road	Railway	Shipping	Weights	Global Weight
Electricity	1	5	5	7	0.615242	0.09812
Road	1/5	1	3	4	0.211136	0.03367
Railway	1/5	1/3	1	4	0.121705	0.01941
Shipping	1/7	1/4	1/4	1	0.0519174	0.0083

Table 3. Comparison Matrix Of sub-criteria of Workforce

	M	T	S	O	Weight	Global Weight
Managerial(M)	1	1/5	1/3	1/5	0.0714673	0.004802
Technical(T)	5	1	1/2	1/3	0.204029	0.01371
Supervisory(S)	3	2	1	1	0.320919	0.02156
Operator(O)	5	3	1	1	0.403584	0.02712

Table 4. Comparison Matrix Of sub-criteria of Operator

	High skilled	Skilled	Semi skilled	Unskilled	Weight	Global Weight
High skilled	1	1/2	5	7	0.3506	0.0095
Skilled	2	1	5	7	0.492676	0.0133
Semi skilled	5	5	1	4	0.110469	0.0029
Unskilled	7	7	4	1	0.0462543	0.0013

Table 5. CI, RI, CR Values For All The Pairwise Comparison Matrices

	Sub criteria of infrastructure	Sub criteria of workforce	Sub criteria of operator	Main criteria
CI	0.098552	0.0880005	0.0671829	0.121314
RI	0.99	0.99	0.99	1.54
CR	0.0995	0.0995	0.06786	0.078775