Journal of Positive School Psychology http://journalppw.com
2022, Vol. 6, No. 10, 3915-3923

Assessment Of Performance Of Agile Supply Chain Enablers For An Indian Industry Using Mcdm

Dr. Vivek Gedam[1*], Sandeep Kumar Dubey[2], Murali Krishna M[3], Ajay Kongari[4], Sudhanshu Atkare[5], Manoj Tiwari[6],

[1]*Associate Professor, Gyan Ganga Institute of Technology and Sciences, Jbp*

[2]*Assistant Professor, Gyan Ganga Institute of Technology and Sciences, Jbp*

[3]*Assistant Professor, Gyan Ganga Institute of Technology and Sciences, Jbp*

[4]*Assistant Professor, Gyan Ganga Institute of Technology and Sciences, Jbp*

[5]*Assistant Professor, Gyan Ganga Institute of Technology and Sciences, Jbp*

[6]*Assistant Professor, Gyan Ganga Institute of Technology and Sciences, Jbp*

***Corresponding Author**: Dr. Vivek Gedam

Abstract-

Purpose-This paper aims to extend the existing body of knowledge of AM and thus provides an interesting aspect for scholars within this area. Furthermore, the researchpaper will reduce the scarcity of research conducted withinthe field of SMEs and AM particularly with regard toAMEs.
Methodology -Twenty interviews with managers have been conducted in order to capture the big picture of how the SMEs in the chosen industry enable responsiveness to changes.
Result - Agile manufacturing is indeed relevant in the studied industry as it is driven by agility drivers and thus characterized by fast-changing technologies and well- educated customers.

Keywords- Agility, Agile Manufacturing (criteria & sub-criteria), Indian industry, Multi criteria decision makingAnalytic Hierarchy process.

1. Introduction

The present business condition is described by quick changing advancements and shorter item life cycles, accomplished clients and wild rivalry. Inside this unique situation, agile manufacturing is applauded in the literature as one of the answers for accomplishing and keeping up an upper hand in turbulent circumstances.
Through the conduction of interviews and surveys, an empirical departure will be taken and thus a contribution to the lack of practical input among the AM theories will be provided. By investigating the SMEs' approaches to maintain and sustain competitive advantage in a turbulent environment, a better illustration of the AM concept can be given which furthermore can lead to a better appreciation by managers.
Based on the conducted literature review, it became apparent that most of the research has been done within industrial management. Analyzing the problem of agility for SMEs through the lenses of strategic management will contribute to the field. As emphasized before, AM is a structure upon which strategic decisions are taken and implemented. Due to this, it is important that the problem is not just tackled from an operational point of view but also with a wider strategic point of view aiming to achieve a strategic fit. In alignment and with respect to the emphasized importance of the AM strategies, the purpose of the paper is in sum to challenge and extend the existing body of knowledge of AM by providing insight in real-life practices applied by SMEs in the Indian industry. By comparing the findings fromthe interviews and surveys with the praised practices in the literature, a model with a specific focus on AM in SMEs for the chosen industry will be provided.

2. Objectives of the Research

The purpose of this master thesis is to fill in the identified gaps by providingempirical examples given by SMEs who are operating in the Indian industry. The findings of the conducted

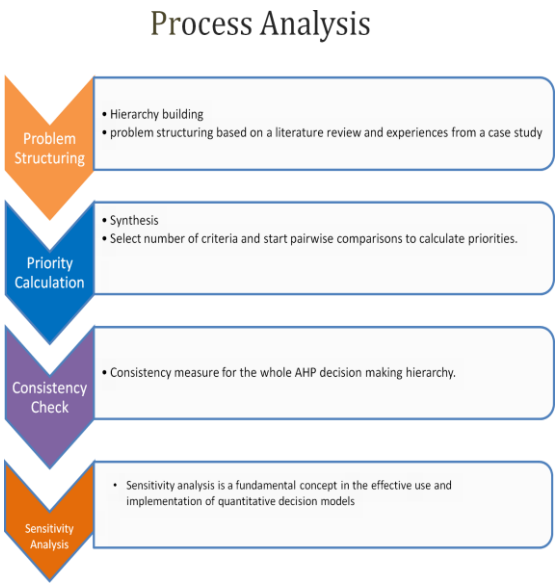
interviews as well as surveys among these small and medium manufacturing companies aim to provide an insight into real-life business practices and processes and thus to contribute to a more practical approach of AM. Furthermore, the conducted research object is to conduce to the body of knowledge of AM within SMEs by challenging the existing theories. The purpose hereby is to identify the enablers used by SMEs to respond to an environment characterized by ADs, like for example fast-changing technology and well- educated and demanding customers. the findings of the conducted interviews and surveys aim to provide proof of this assumption by answering the following sub-questions:

- What are the drivers for implementing AM?
- What enablers are used by SMEs in order to react to unpredicted changes in their environment and are these enablers coherent with the ones praised in the literature?
- What are the advantages and disadvantages of SMEs with regard to responsiveness?

3. Literature Review

1) Bharat Singh Patel et.al**,** Analysis of agile supply chain enablers for an Indian manufacturing organization; January 2020; International Journal of Agile Systems and Management 13 (1):1 Manisra Baramichai, Emory W. Zimmers Jr and Charalambos A. Marangos The Center for Competing in Volatile Markets, Industrial Marketing Management, Vol 29., No. 1., 2000.
2) Y.Y. Yusuf a,*, A. Gunasekaran b, E.O. Adeleye c, K. Sivayoganathan Agile supply chain capabilities: Determinants , Agile supply chain capabilities: Business School, University of Hull, Hull HU6 7 RX, UK Department of Management, University of Massachusetts, 285 Old Westport Road, North Dartmouth, MA 02747-2300, USA Department of Mechanical and Manufacturing Engineering, Nottingham Trent University, Nottingham, NGI 4BU, UK Determinants European Journal of Operational Research 159 (2004) 379–392
3) Dr. John Engineering Logistics and Distribution (CELDI), Lehigh University, Bethlehem, Pennsylvania, USA, Agile supply chain transformation matrix: an integrated tool for creating an agile enterprise, Supply Chain Management: An International Journal Volume 12 · Number 5 · 2007 · 334–348
4) Martin Christopher Cranfield School of Management, UK "The Agile Supply Chain": p. shewchuk, chair dr. kimberly p. ellis dr. subhash c. sarin, industrial and systems engineering, december 1, 1998 blacksburg, virginia. Product life cycle, design /reconfiguration strategy, agile manufacturing. Design and reconfiguration of manufacturing systems in agile manufacturing environments.
5) Khan Nasir, Sanjay Gomasta International Journal for Research in Applied Science & Engineering Technology (IJRASET) Agile Manufacturing: A Case Study in India Department of Mechanical & Automation Engineering Amity University Gwalior, MP

4) Methodology



- The Analytic Hierarchy Process (AHP) is a multi-criteria decision-making approach. The AHP is a decision support tool which can be used to solve complex decision problems.
- It uses a multi-level hierarchical structure of objectives, criteria subcriteria and alternatives.

The pertinent data are derived by using a set of pairwise comparisons. These comparisons are used to obtain the weights of importance of the decision criteria, and the relative performance measures of the alternatives in terms of each individual decision criterion. If the comparisons are not perfectly consistent, then it provides a mechanismfor improving consistency.

5) Implementation of the AHP

The AHP can be implemented in three simple consecutive steps:

- Computing the vector of criteria weights.
- Computing the matrix of option scores.
- Ranking the options.
- Each step will be described in detail in the following. It is assumed that *m* evaluation criteriaare considered, and *n* options are to be evaluated

6) Checking the consistency

When many pair wise comparisons are performed, some inconsistencies may typically arise. One example is the following. Assume that 3 criteria are considered, and the decision maker evaluates that the first criterion is slightly more important than the second criterion, while the second criterion is slightly more important than the third criterion. An evident inconsistency arises if the decision maker evaluates by mistake that the third criterion is equally or more important than the first criterion. On the other hand, a slight inconsistency arises if the decision maker evaluates that the First criterion is also slightly more important than the third criterion. A consistent evaluation would be, for instance, that the first criterion is more important than the third criterion.

After the study and having field survey and visits done on the Indian industries, an unstructured interview was conducted at different management, employees & workers from different department, visitors and society. The summary of interview and discussion is used to generate the data that we are now using for the analysis.

7) Execution of AHP

Ranking	Description
1	Extremely Low
2	Very Low
3	Low
4	Between Low To Moderate
5	Moderate
6	Between Moderate To High
7	High
8	Very High
9	Extremely High

8) Equivalent Scores in Saaty's Scale

The average values obtained against the criteria and sub-criteria were subjected tocomputation to get their equivalent scores in Saaty‟s scale of range 1 -9 using the formula given below:

$Y = 1+ [(X-Xmin) \times 8 \div (Xmax- Xmin)]$

Y - Equivalent score in Saaty‟s 1-9 scale.

X - Average value specified by the competent personnel.

Xmin - Minimum value specified by the competent personnel.

Xmax - Maximum value specified by the competent personnel

Table1.1: Equivalent Score of Criteria

Criteria	Average Value (X)	Equivalent Score In Saaty Scale (Y)
Value chain integration	5.2	3
Human resource	4.2	1
Agile manufacturing technology	7.6	9
Knowledge Management	6.8	7
Concurrent Engineering	5.8	5

9) Analysis

Table 1.2: Equivalent Score of Sub-criteria of Value chain integration

Sub-criteria	Average Value (X)	Equivalent Score In Saaty Scale (Y)
Interdepartmental Cooperation	6.2	6
Suppliers	7.2	9
Customer	4.6	1

Table1.3: Equivalent Score of Sub-criteria of Human resource

Sub-criteria	Average Value (X)	Equivalent Score In Saaty Scale (Y)
Socialization	6.8	7
Teamwork	4.6	1
Pool Of Idea	5.8	4
Autonomy	7.4	9

Table 1.4: Equivalent Score of Sub-criteria of Agile manufacturing technology

Sub-criteria	Average Value (X)	Equivalent Score In Saaty Scale (Y)
Close communication withbusiness partner	5.6	4
flat hierarchy	4.6	1
handcraft and customize production	7.4	9

Table 1.5: Equivalent Score of Sub-criteria of Knowledge Management

Sub-criteria	Average Value (X)	Equivalent Score In Saaty Scale (Y)
teamwork	5.6	5
socialization	4.2	1
Transactive memory system	6.8	9

Table 1.6: Equivalent Score of Sub-criteria of Concurrent Engineering

Sub-criteria	Average Value (X)	Equivalent Score In Saaty Scale (Y)
multifunctional team	6.2	5
close collaboration early inthe process with business partners	7.6	9
transparency	4.8	1

10. Pairwise Comparison Analysis

The procedure followed to develop the pairwise comparison matrices is described here. As an example the equivalent scores in Saaty‟s scale of Agile Manufacturing criteria titled “Value Chain Integration‟, “Human Resource‟ and “Agile Manufacturing Technology‟ is 3, 1 and 9 respectively. So the pairwise comparisons of “Value Chain Integration‟ against “Value Chain Integration‟, “Human Resource‟ and “Agile Manufacturing Technology‟ individually are 3/3, 3/1 and 3/9 respectively. Thus, the entire pairwise comparison matrix has been completed and listed in following tables.

Table:1.7 Abbreviations for Agile Manufacturing Criteria and Sub-Criteria

Criteria	Abbreviations
Value chain integration	VCI
Human resource	HR
Agile manufacturing technology	AMT
Knowledge Management	KM
Concurrent Engineering	CE

Table:1.8 Abbreviations for Agile Manufacturing Sub - Criteria and Abbreviations

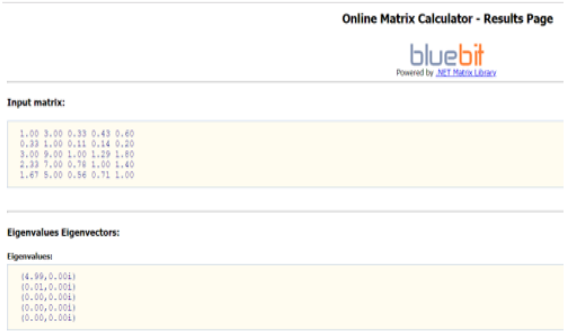
Sub - Criteria	Abbreviations
Interdepartmental Cooperation	VCI 1
Suppliers	VCI 2
Customer	VCI 3
Socialization	HR 1
Teamwork	HR 2
Pool Of Idea	HR 3
Autonomy	HR 4
Close communication with business partner	AMT 1
flat hierarchy	AMT 2
handcraft and customize production	AMT 3
Teamwork	KM 1
Socialization	KM 2
transactive memory system	KM 3
multifunctional team	CE 1
close collaboration early in the process	CE 2
Transparency	CE 3

Table:1.9 Pairwise comparison matrix of Agile Manufacturing Criteria

	VCI	HR	AMT	KM	CE	Normalized Value	Local Sensitivity
VCI	1	3/1	3/9	3/7	3/5	5.36	0.12
HR	1/3	1	1/9	1/7	1/5	1.79	0.04
AMT	9/3	9/1	1	9/7	9/5	16.09	0.36
KM	7/3	7/1	7/9	1	7/5	12.51	0.28
CE	5/3	5/1	5/9	5/7	1	8.94	0.20
GRAND TOTAL						45	1.00

11. Checking the consistency

In order to check the consistency of the responses two parameters namely CI and CR werecalculated. The formula used to calculate CI and CR are presented below:
Consistency index (CI) = | λmax – n | ÷ (n - 1)
Consistency ratio (CR) = CI ÷ RI
Where, λmax = Max. Eigen value of the matrixn = Size of the matrix,
RI = Random index



As mentioned earlier, in order to calculate CI, the Max. Eigen value (λmax) was required to be calculated. For this calculation purpose online matrix calculator has been used. Further, in order to calculate CR, the RI values are drawn from Saaty‟s table of random indices which is presented in following Table 1.10

Table: 1.10 Saaty’s table of random indices against the sizes of the matrix

N	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49
N = Size of the Matrix RI = Average Random Index										

Subsequently, the calculations are to be carried out on λmax, CI and CR values. The λmax value was found to be 4.99 for above matrix. Since this is 5 X 5 matrix, so the value of n will be taken as

5 which is the size of matrix. The value of RI for n=5 is taken as 1.12 as given in Table. Substitution of these values in the above Equations is shown below:

CI = | 4.99 – 5 | ÷ (5 – 1) = 0.0025

CR = CI ÷ RI = 0.0025 ÷ 1.12 = 0.0022

As a thumb rule which is employed by many authors, when CR is less than 0.1 or 10%. It can beconcluded that, the responses are considered as "consistent". Since analysis is consistent, final ranking can be done as shown in following Table.

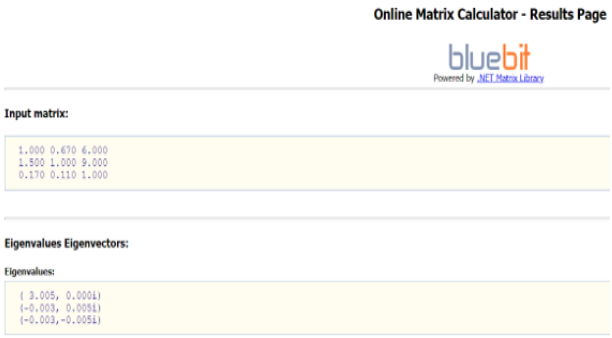
Table:1.11 Local sensitivities of Agile Manufacturing Criteria

Criteria	VCI	HR	AMT	KM	CE
Local Sensitivity	0.12	0.04	0.36	0.28	0.20
Rank	4	5	1	2	3

Table:1.12 Pairwise comparison matrix of Sub Criteria of Value Chain Integration

	VCI 1	VCI 2	VCI 3	Normalized Value	Local Sensitivity
VCI 1	1	6/9	6/1	7.67	0.37
VCI 2	9/6	1	9/1	11.50	0.56
VCI 3	1/6	1/9	1	1.28	0.06
GRAND TOTAL				20.45	1.00

Checking the consistency



CI = | 3.005 – 3 | ÷ (3 – 1) = 0.0025

CR = CI ÷ RI = 0.0025 ÷ 0.58 = 0.004

It can be concluded that, the responses are considered as "consistent". Since analysis is consistent, final ranking can be done as shown in following Table.

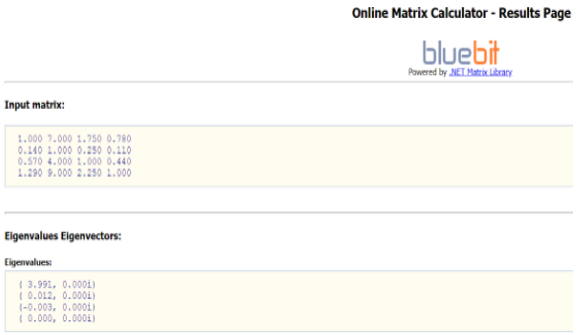
Table:1.13 Local sensitivities of Value Chain Integration

Criteria	VCI 1	VCI 2	VCI 3
Local Sensitivity	0.37	0.56	0.06
Rank	2	1	3

Table: Pairwise comparison matrix of Sub Criteria of Human Resource

	HR 1	HR 2	HR 3	HR 4	Normalized Value	Local Sensitivity
HR 1	1	7/1	7/4	7/9	10.53	0.33
HR 2	1/7	1	1/4	1/9	1.50	0.05
HR 3	4/7	4/1	1	4/9	6.02	0.19
HR 4	9/7	9/1	9/4	9/9	13.54	0.43
GRAND TOTAL					31.59	1.00

Checking the consistency



CI = | 3.991 – 4 | ÷ (4 – 1) = 0.003 CR = CI ÷ RI = 0.003 ÷ 0.9 = 0.003

It can be concluded that, the responses are considered as "consistent". Since analysis is consistent, final ranking can be done as shown in following Table.

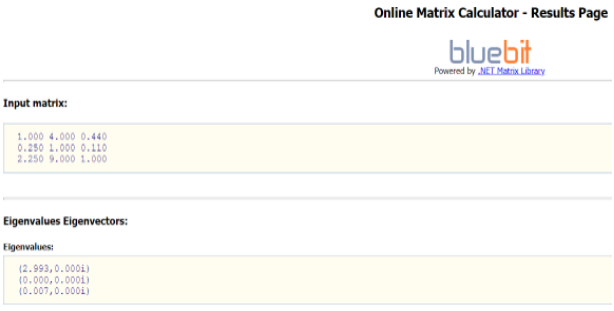
Table:1.14 Local sensitivities of Human Resource

Criteria	HR 1	HR 2	HR 3	HR 4
Local Sensitivity	0.33	0.05	0.19	0.43
Rank	2	4	3	1

Table:1.15 Pairwise comparison matrix of Sub Criteria of Agile manufacturing technology

	AMT 1	AMT 2	AMT 3	Normalized Value	Local Sensitivity
AMT 1	1	4/1	4/9	5.44	0.29
AMT 2	1/4	1	1/9	1.36	0.07
AMT 3	9/4	9/1	1	12.25	0.64
GRAND TOTAL				19.05	1.00

Checking the consistency



CI = | 2.993 – 3 | ÷ (3 – 1) = 0.0035 CR = CI ÷ RI

= 0.0035 ÷ 0.58 = 0.006
It can be concluded that, the responses are considered as "consistent". Since analysis is consistent, final ranking can be done as shown in following Table.

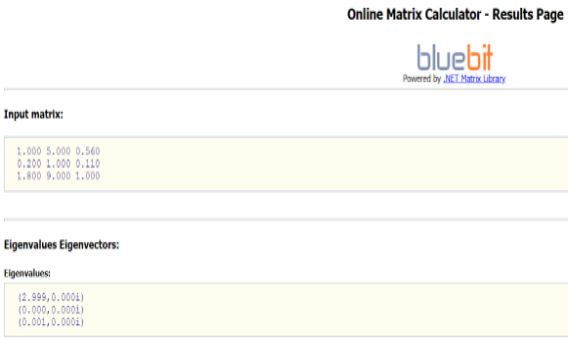
Table:1.16 Local sensitivities of Agile manufacturing technology

Criteria	AMT 1	AMT 2	AMT 3
Local Sensitivity	0.29	0.07	0.64
Rank	2	3	1

Table:1.17 Pair wise comparison matrix of Sub Criteria of Knowledge Management

	KM 1	KM 2	KM 3	Normalized Value	Local Sensitivity
KM 1	1	5/1	5/9	6.56	0.33
KM 2	1/5	1	1/9	1.31	0.07
KM 3	9/5	9/1	1	11.80	0.60
GRAND TOTAL				19.67	1.00

Checking the consistency



CI = | 2.999 – 3 | ÷ (3 – 1) = 0.0005 CR = CI ÷ RI = 0.0005 ÷ 0.58 = 0.0008
It can be concluded that, the responses are considered as "consistent". Since analysis is consistent, final ranking can be done as shown in following Table.

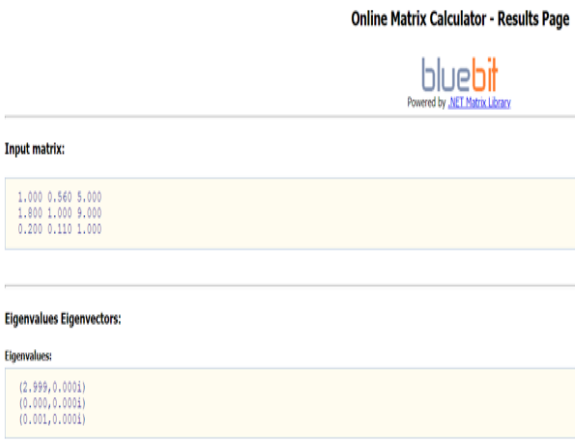
Table:1.18 Local sensitivities of Knowledge Management

Criteria	KM 1	KM 2	KM 3
Local Sensitivity	0.33	0.07	0.60
Rank	2	3	1

Table:1.19 Pair wise comparison matrix of Sub Criteria of Concurrent Engineering

	CE 1	CE 2	CE 3	Normalized Value	Local Sensitivity
CE 1	1	5/9	5/1	6.56	0.33
CE 2	9/5	1	9/1	11.80	0.60
CE 3	1/5	1/9	1	1.31	0.07
GRAND TOTAL				19.67	1.00

Checking the consistency



CI = | 2.999 – 3 | ÷ (3 – 1) = 0.0005 CR = CI ÷ RI = 0.0005 ÷ 0.58 = 0.0008
It can be concluded that, the responses are considered as "consistent". Since analysis is consistent, final ranking can be done as shown in following Table.

Table:1.20 Local sensitivities of Concurrent Engineering

Criteria	CE 1	CE 2	CE 3
Local Sensitivity	0.33	0.60	0.07
Rank	2	1	3

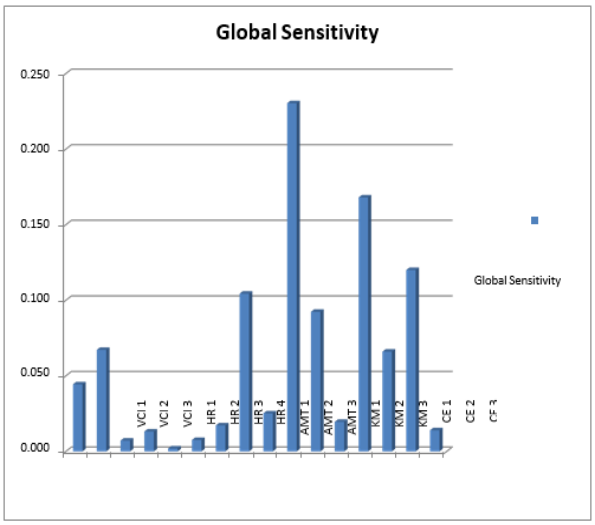
Global sensitivity

Global sensitivity = Local sensitivity of Criteria × Local sensitivity of Sub-criteria

Table:1.21 Local & Global sensitivity of Agile Manufacturing criteria and sub-criterion

Criteria	Local Sensitivity (A)	Sub-Criteria	Local Sensitivity (B)	Global Sensitivity (A*B)
VCI	0.12	VCI 1	0.37	**0.044**
		VCI 2	0.56	**0.067**
		VCI 3	0.06	**0.007**
HR	0.04	HR 1	0.33	**0.013**
		HR 2	0.05	**0.002**
		HR 3	0.19	**0.008**
		HR 4	0.43	**0.017**
AMT	0.36	AMT 1	0.29	**0.104**
		AMT 2	0.07	**0.025**
		AMT 3	0.64	**0.230**
KM	0.28	KM 1	0.33	**0.092**
		KM 2	0.07	**0.020**
		KM 3	0.60	**0.168**
CE	0.20	CE 1	0.33	**0.066**
		CE 2	0.60	**0.120**
		CE 3	0.07	**0.014**

Figure:1.1: Global Sensitivity



Tale:1.22 Ranking of Agile Manufacturing Sub-Criteria

Sub-Criteria	Abbreviation	Global Sensitivity	Rank
Handcraft and Customize Production	AMT 3	0.230	1
Transactive Memory System	KM 3	0.168	2
Close Collaboration Early in the Process with Business Partners	CE 2	0.120	3
Close Communication with Business Partner	AMT 1	0.104	4
Teamwork	KM 1	0.092	5
Suppliers	VCI 2	0.067	6
Multifunctional Team	CE 1	0.066	7
Interdepartmental Cooperation	VCI 1	0.044	8
Flat Hierarchy	AMT 2	0.025	9
Socialization	KM 2	0.020	10
Autonomy	HR 4	0.017	11
Transparency	CE 3	0.014	12
Socialization	HR 1	0.013	13
Pool Of Idea	HR 3	0.008	14
Customer	VCI 3	0.007	15
Teamwork	HR 2	0.002	16

Agile manufacturing is indeed relevant in the studied industry as it is driven by agility drivers and thus characterized by fast-changing technologies and well-educated customers. However, theagile manufacturing enablers partly differ from the ones praised in the literature and are more adjusted to the size and characteristics of SMEs.

For example, sub criteria “AMT3” was highly rank to the quality of agility and it came second to “KM3” the sub criteria second responsiveness and third to CE2 is improve the agility.

Agile manufacturing is to be sure significant in the contemplated business as it is driven by agility drivers and hence portrayed by quick changing innovations and accomplished clients. However, the agile manufacturing enablers mostly contrast from the ones adulated in the literature and are more changed in accordance with the size and qualities of SMEs. All things considered, a cognizant consciousness of the agile manufacturing concept itself was not found and the empowering influences distinguished were somewhat portrayed as sensible business considering. The agile manufacturing enablers applied in the selected industry will be developed. This quotation highlights the fact that change will always be there, no matter if it is in one’s personal life, society or the business enviro-nment. It is up to the people themselves to dealwith this change and to create opportunities out of it. Companies nowadays are confronted daily with an environment that is characterized by fast-changing technologies and market requirements, as well as well-educated customers. Within this context, the AM concept is praisedas being one of the solutions to respond not just to such a turbulent environment, but also to achieve and maintain a competitive advantage through the right set of tools and strategies. While the literatures’ richness of AM definition, concepts and enablers for large companies was highly visible, barely any attempt has been made to challenge the concepts’ relevancy and applicability in the context of SMEs. Therefore, this master thesis’ purpose was to shed light on the AM concept itself and to scrutinize the concepts enablers suitable for SMEs, and thus companies with less financial resources than the large ones. The aim hereby was to challenge and to extend the existing body of knowledge not just by identifying the practices used by SMEs in the Indian industry in the quest to achieve high responsiveness, but also by providing a more practical approach gained from real-life examples. In coherence with this purpose, the main contribution of this master thesis was the creation of a model illustrating the AMEs applied in SMEs in the Indian industry (see figure 15). Furthermore, this model will give other SMEs the possibility to reflect on their practices and to identify feasible areas of improvement.

8. References

[1]. Akgün A. E., Byrne John C., Heskin H, and Lynn Gary S., 2006. Transactive Memory System in New Product Development Teams. IEEE Transactions On Engineering Management, 53 (1), pp. 95-111.

[2]. American Management Association, 2006.

Agility and Resilience in the Face of Continuous Change Retrieved from: http://www.cmcamai.org/node/497Access ed 2011/05/22

[3]. Amin S. M., and Horrowotz, B. M., 2008. Towards Agile and Resilient Large-Scale Systems: Adpative Robust National /International Infrastructures. Global Journal of Flexible System Management, 9 (1), pp. 27 – 40.

[4]. Baker J., 1996. Agility and Flexibility what is the difference?. Working paper, Cranfield School of Management

[5]. Blackhouse C. J., and Burns, N.D., 1999. Agile Value Chains for Manufacturing – Implications for performance measures. International Journal of Agile Manage-ment Systems, 1 (2), pp. 76-82.

[6]. Bohan, R., 2010. Small Manufactures need to be lean, not agile. Industry Week, 259 (11),pp. 36 -37.

[7]. Booth, R., 1996. Agile Manufacturing. Engineering Management Journal, April 1996, pp.105 – 112.

[8]. Bottani, E., 2010. Profile and enablers of agile companies: An empirical investigation. International Journal of Production Economics, 125 (2), pp. 251-261.

[9]. Breu, K., Hemingway, S.J., Strathern, M., and Bridger, D., 2002. Workforce agility: the new employee strategy for the knowledge economy. Journal of Information Technology, 17 (1), pp. 21–31.

[10]. Brown, S., and Bessant, J., 2003. The manufacturing strategy-capabilities links in m*ass customization and agile manufacturing – an exploratory study. International Journal of Operations & Production Management, 23 (7), pp. 707 – 730.

[11]. Bryman, A., and Bell, E., 2007. Business research methods. 2nd ed. Oxford:Oxford University. Press

[12]. Burgelman R. A, and Doz Y. L., 2001. The Power of Strategic Integration. MIT Sloan Management Review, 42 (3), pp.28 – 38.

[13]. Christensen, L., Engdahl, N., Grääs, C., and Haglund, L., 2001. Marknads under sökning - enhandbok. 2nd ed. Lund: Studentlitteratur.

[14]. Christopher M., 2000. The Agile Supply Chain: Competing in Volatile Markets. Industrial Marketing Management, 29 (1), pp. 37 – 44.

[15]. Cooke, J. L., 2010. Agile Principles Unleashed: Proven Approaches for Achieving Real Productivity in Any Organization. Ely, U.K.: IT Governance Pub

[16]. Corbett, L.M., and Campbell-Hunt, C., 2002. Grappling with a Gusher! Manufacturing's Response to business success in small and medium enterprises. Journal of Operations Management, 20, pp. 495 – 517.

[17]. Coronado. A. E., 2003. A Framework to Enhance Manufacturing Agility using Information Systems in SMEs. Industrial Management & Data Systems, 103 (5), pp. 310-323.

[18]. DeVor, R., Graves, R., Mills, J.J., 1997. Agile Manufacturing research: accomplishments and opportunities. IIE Transaction, 29, pp. 813 – 823.

[19]. Elkins, D.A., Huang, N., and Alden, J.M., 2004. Agile Manufacturing systems in the automotive industry. International Journal of Production Economics, 91, pp. 201 – 214. Esturilho,

[20]. C.G., and Estorilio, C., 2010. The deployment of manufacturing flexibility as a function of company Strategy. Journal of Manufacturing Technology Management, 21 (8), pp. 971–989.

[21]. European Commission, 2005. The new SME definition. User guide and model declaration Retrieved from: http://ec.europa.eu/enterprise/policies/sme/fi les/sme_definition/sme_user_guide_en.pdfA cces sed 2011/01/04 European Comm-ission, 2009.

[22]. SBA Fact Sheet Sweden 09 Retrieved from:http://ec.europa.eu/enterprise/policies/ sme/facts-figures-analysis/performance-review/pdf/final/sba_fact_sheet_sweden_e n.pdfAccessed 2011/04/21

[23]. Gan, D., and Jermyn, L., 2003. Sweden. Marshall Cavendish Corp

[24]. Ghauri, P. N., and Grønhaug, K., 2005. Research methods in business studies: A practical guide. 3rd ed. Harlow, England ; New York: Financial Times Prentice Hall Goldman.

[25]. S. L., Nagel, R. N., and Preiss, K., 1995. Agile competitors and virtual organi-zations: Strategies for enriching the customer.New York:

[26]. Van Nostrand Reinhold Grant, R., 2010. Contemporary Strategy Analysis. 7th ed. Chinchester: JohnWiley& Sons, Ltd.

[27]. Gunasekaran, A., 1999. Agile

manufacturing: a framework for research and development. International Journal of Production Economics, 62 (1/2), pp. 87-105.

[28]. Gunasekaran, A., 2001. Agile manufacturing: The 21st century competitive strategy. 1st ed. Oxford; New York: Elsevier

[29]. Gunasekaran, A., and Yusuf, Y. Y., 2002.Agile manufacturing: A taxonomy of strategic and technological imperatives. International Journal of Production Research, 40 (6), pp. 1357–1385. Gunasekaran, A., Tirtiroglu, E., and Wolstencroft, V., 2002. An investigation into the application of agile manufacturing in an aerospace company. Technovation, 22 (7), pp. 405 – 415. Hayes, R. H., and Pisano, G. P., 1994. Beyond World Class: The New Manufacturing Strategy. Harvard Business Review, January- February 1994, pp. 77–86.

[30]. Ifandoudas, P., and Chapman, R., 2010. A practical approach to achieving Agility-a theory of constraints perspective. Production Planning and Control, 20 (8), pp. 691 – 702. Iacocca Institute, 1991. 21st Century Manufacturing Enterprise Strategy – AnIndustry-Led View. Iacocca Institute, Bethlehem, PA.

[31]. Ismail, H.S, and Sharifi, H., 2006. A balanced approach to building agile supply chains. International Journal of Physical Distribution and Logistics Management, 36 (6), pp. 431 – 444.

[32]. Ismail, H., Reid, I., Mooney, J., Poolton, J., and Arokiam, I., 2007. How Small and Medium Enterprises Effectively Participate in the Mass Customization Game. IEEE Transactions on Engineering Management. 54 (1), pp. 86 – 97.

[33]. Jiang J-C, Chen K-H., 2007. Development of a Collaborative Manufacturing, Planning, and Scheduling System: Integrating Lean and Agile Manufacturing for the Supply Chain.International Journal of Management, 24 (2), pp. 331 – 345. Jin-Hai L., Anderson A. R., and Harrison R. T., 2003.The evolution of agile manufacturing. Business Process Management Journal, 9 (2), pp. 170 – 189.

[34]. Kathuria, R., Partovi, F.Y., 1999. Work force management practices for manufacturing flexibility. Journal of Operations Management, 18 (1), pp. 21–39.

[35]. Kidd, P. T., 1994. Agile manufacturing: Forging new frontiers. Wokingham:

[36]. Addison-Wesley. Kumar A., Motwani J., 1995.A methodology for assessing time-based competitive advantage of manufacturing firms. International Journal of Operationsand Production Management, 15 (2), pp. 36 – 53.

[37]. Laanti, M., Salo, O., Abrahamsson, P., 2011. Agile methods rapidly replacing traditional methods at Nokia: A survey of opinion on agile transformation. Information and Software Technology, 53 (3), pp 276 – 290.

[38]. Lee H. L., 2004. The Triple-A Supply Chain. Harvard Business Review, 82 (10), pp. 102 – 112. Marczyk, G., DeMatteo, D., Festinger, D., 2005. Essential of Research Design and Methodology.

[39]. John Wiley & Sons, Inc. Marschan-Piekkari, R. and Welch, C., 2004. Handbook of qualitative research methods for international business.

[40]. Cheltenham, UK; Northampton, MA: Edward Elgar McCann J., Sleky J. and Lee J., 2009. Building Agility, Resilience and Performance in Turbulent Environments. People and Strategy, 32 (3), pp. 44 -51