Chapter 6

A Methodology and Framework for Flexibility Performance Measurement of Supply Chains

The previous chapter demonstrates use of DEA to facilitate measurement and benchmarking of SC flexibility. This chapter proposes a framework and a methodology for flexibility performance measurement of SC. The framework identifies flexibility objectives and its contributing attributes at four levels of the SC and suggests taxonomy of flexibility performance measures. A methodology to prioritise the contribution of each performance attribute to achieve the desired flexibility objective using AHP has also been proposed and demonstrated in this study.

6.0 INTRODUCTION

Flexibility measures are different from resource and output measures in many aspects. Stevenson & Spring (2007) indicates that flexibility is a measure of the possible behavior, whereas other operational performance measures are demonstrated by the system's operating parameters. This implies that flexibility does not have to be demonstrated by the system in order to exist. Measuring something which the system does not exhibit in its normal course is somewhat challenging. Therefore, in most cases, the contributing attributes that enables flexibility potential is measured to assess the flexibility performance capability. Many authors suggested frameworks for flexibility performance measurement, though there is little consensus in the different measurement frameworks suggested by different authors" (Beamon, 1999b; I. J. Chen & Paulraj, 2004; Cho et al., 2012; Grigore, 2007; Stevenson & Spring, 2007). Chapter 4 proposes a method to determine flexibility performance measure of a SC using modified Fuzzy Analytic Hierarchical Process. The usage of suggested measurement framework is also demonstrated using sample data at Chapter 4. Chapter 5 demonstrates the application of Data Envelopment Analysis (DEA) to facilitate effective measurement and benchmarking of SC flexibility. DEA helps in finding relative efficiencies of similar SCs, bench marking and evaluate areas of possible improvements. This chapter presents a conceptual framework for flexibility performance measure of a SC. Taxonomy of flexibility

performance measures in SC context is also presented in this study. The work is also extended to illustrate a method to quantify and prioritize contribution of performance indicators towards achieving SC flexibility based on Analytical Hierarchical Process (AHP).

6.1 Framework for Flexibility Performance Measurement in SCs

In this section, an integrated framework for Flexibility Performance Measurement in SCs is presented. *Plan*, *source*, *make* and *deliver* are the four principal components or 'links' of the SC (Stewart, 1997). The Supply-Chain Operations Reference Model (SCOR) developed by the Supply Chain Council (SCC) is also structured in four levels and is based on *plan*, *source*, *make* and *deliver* links (Archie Lockamy & McCormack, 2004). SCOR Model later (2012) modified to include two more management processes namely 'Return' and 'Enable' ("Quick Reference Guide SCOR Supply Chain Operations Reference Model," 2017). Gunasekaran, Patel, & Tirtiroglu (2001) proposed an integrated framework for performance measurement in SC based on these same four links. Thus, based on literature, it is found that basing a SC on the four links; *plan*, *source*, *make* and *deliver*, is appropriate and best defines SC management in terms of describing the core functions within the SC management (Gunasekaran et al., 2001; Archie Lockamy & McCormack, 2004; Shepherd & Günter, 2011). The definition of these four links as given by the Supply Chain Council (SCC) is given at Figure 6.1.

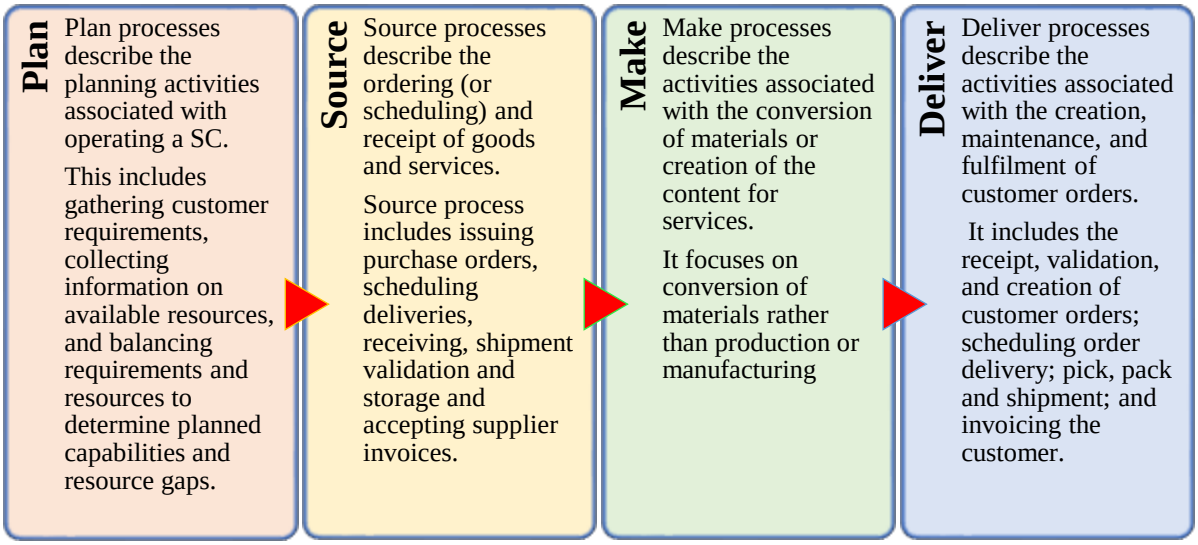

Figure 6.1 Supply Chain Links and their Definition

If the SC must be flexible, each link of the SC needs to be flexible. Since flexibility is multi-dimensional, being flexible in one link does not necessarily mean that SC will be flexible in other links (Stevenson & Spring, 2007). Therefore, after identifying the links of the SC, the study identified a set of *'flexibility objectives'* at each link. Further, the *'flexibility objectives'* at each link of the SC can be achieved by a set of '*contributing attributes'*. Based on literature reviewed and expert opinion, these '*flexibility objectives'* and '*contributing attributes'* at the four links of the SC are identified and are enumerated in the succeeding section.

6.1.1 Plan

Planning involves processes that balance aggregate demand and supply to develop a course of action, which meets supply, production, and delivery. In a SC, balancing of resources with requirements is the '*Plan'* function. It also establishes and communicates plans for the SC and aligns the SC with the strategic objectives. The *flexibility objectives* of the '*Plan'* link is ensuring 'short product development cycle time' and 'have alternate strategies to meet contingences'. The contributors that cater to meet the above objectives are identified as market research, forecasting ability and product research and development resources including availability of product development team. Since flexibility is not an observed or displayed attribute, but a capability within the SC, deliberate planning and conducting of flexibility practice drills will provide a measure of flexibility in SC (Chae, 2009; Archie Lockamy & McCormack, 2004; Stewart, 1997).

6.1.2 Source

Sourcing involves processes that procure goods and services to meet planned demand. The activities in 'Sourcing' link include scheduling of deliveries; accept, inspect and store product; decide on supplier payments, identify supply sources, evaluate supplier and maintain records. The flexibility objectives in the '*Source'* link is identified as the easiness in switching supply sources and development and maintenance of 'alternate inventory'. Flexibility in *sourcing* is achieved by maintaining suitable relationship with suppliers so that changes in type, volume, quality and location are achievable. The cost of changing supplier(s), cost of changing inventory, material flexibility and alternate supply logistics are the identified contributing attributes to flexibility at the 'source' link of the SC (Chae, 2009; Archie Lockamy & McCormack, 2004; Taticchi et al., 2010; Trkman & Groznik, 2006).

6.1.3 Make

These processes transform product to a finished state to meet planned or actual demand. The activities in this area include schedule production activities, produce and test, package, and release product to deliver; manage rules, in-process products (WIP), equipment and facilities, production network, and regulatory compliance for production. The 'flexibility' objectives in '*Make'* function are identified as the ability to change product type, product mix and volume and the ability to switch manufacturing facility in terms of plants, people, equipment and process. Attributes that will help in achieving the above mentioned 'objectives' are identified as availability of multiple production facilities, outsourcing capability, multi-skill of employees, ability to postpone final assembly as later as possible, machine flexibility and process flexibility (Chae, 2009; Archie Lockamy & McCormack, 2004; Stewart, 1997).

6.1.4 Deliver

This includes processes that provide finished goods and services to meet customer demand. Activities in this domain includes all order management steps from processing customer inquiries and quotes to routing products and selecting transporters, warehouse management, delivery to the customer, installation and customer training if required. The objectives in achieving flexibility in '*Delivery'* are the ability to receive, transport, store and deliver when source, inventory, schedule and customer change. The attributes that will contribute to flexibility in '*Delivery'* are identified as the ability to shift mode of transportation, volume and mix transported; change in response time when order changes; cost for order changes and responsiveness to urgent orders

The proposed framework for SC Flexibility measurement is given at Figure 6.2. The framework links all the four links of SC management. A good performance management process defines how an organisation uses various systems to manage its performance (Bititci et al., 1997b). Care has been taken to make the framework relevant and reflects the organisation strategy and objectives. The framework also strikes a balance between financial and non-financial measures as well as qualitative and quantitative measures. The framework indicates how flexibility is addressed at the four-basic links of the SC and identifies the attributes that contribute to achieving the flexibility objectives. There will be an information system enveloping all the four links, which enables monitoring and provides a feedback system. This

information system is the heart of performance measurement system, which should integrate all relevant information (Bititci et al., 1997b).

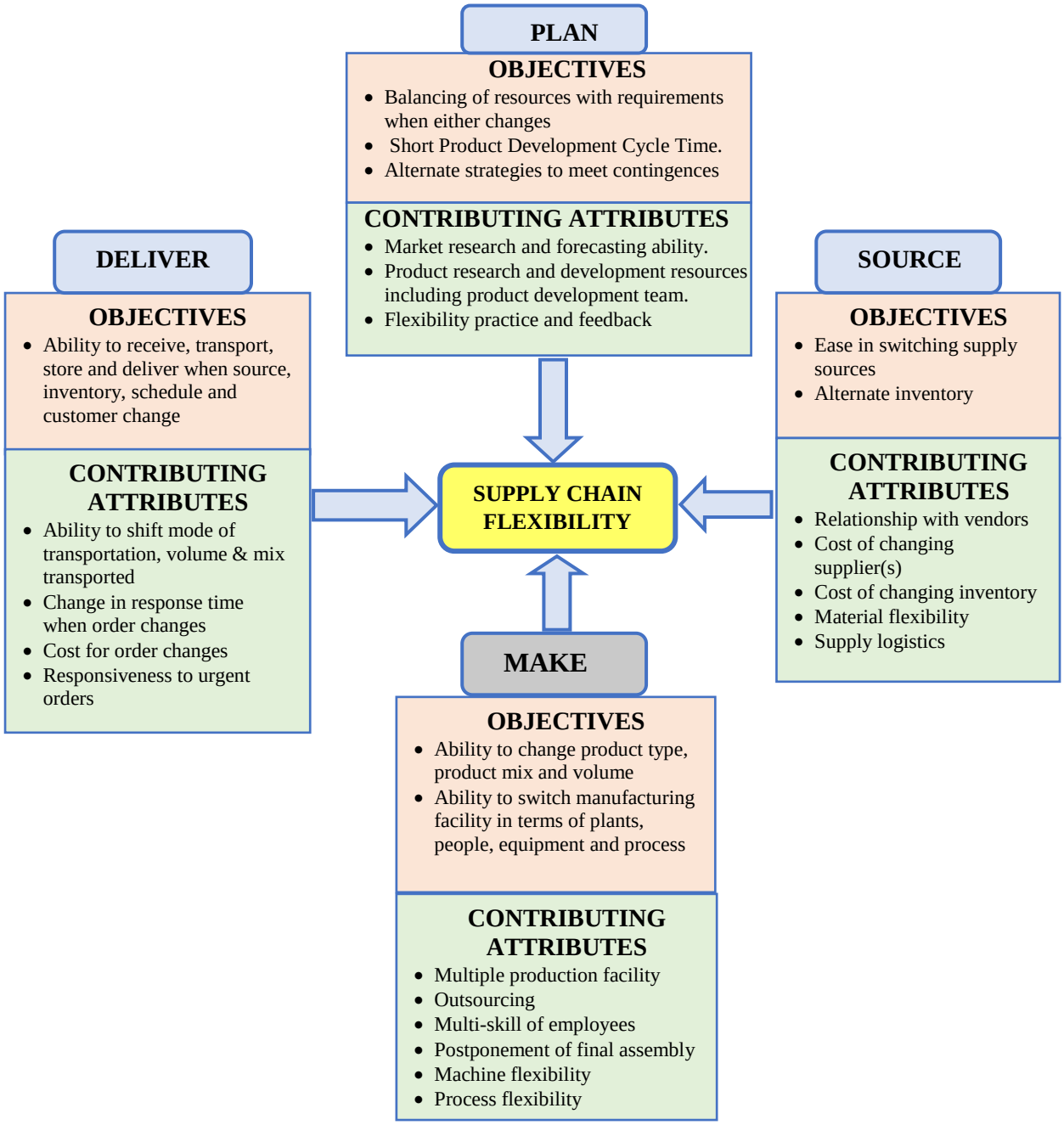

Figure 6.2 Framework for Flexibility Performance Measurement in SC

After having this framework of flexibility defined, further concerns are to arrive at performance indices that will provide a quantitative measure of 'Contributing Measures' and prioritisation of the 'Contributing Attributes' identified at the flexibility performance framework. These two concerns are addressed in the succeeding sections of this chapter.

6.2 Taxonomy of Flexibility Performance Measures

The proposed framework for flexibility performance measurement in SC as given at Figure 6.2 provides a list of contributing attributes to achieve flexibility at the four levels of SC. A quantitative measure of these contributing attributes is possible by identifying a set of measurable performance indices related to each of the contributing attributes. The taxonomy of the performance measure will help in arriving at numerical values of the Flexibility attributes. Based on review of related literature (Cho et al., 2012; Duclos et al., 2003; Fantazy et al., 2008, 2009; Gorane & Kant, 2013; More & Babu, 2012; Sethi & Sethi, 1990; Shepherd & Günter, 2011; Suwignjo et al., 2000) and expert opinion generated through Delphi method, taxonomy of flexibility performance measures is formulated as part of this study. The flexibility measures include both Quantitative (QN) and Qualitative (QL) measures and are categorised as measures of Cost (C), Time (T) and Quality (Q). The taxonomy of flexibility performance measures at the four links is given at Table 6.1.

Table 6.1 Taxonomy of Flexibility Performance Measures

Supply Chain link	Contributing attribute	Contributing taxonomy of performance measure	Type of measure: Cost (c); Time (t); Quality (q) Quantitative (qn); Qualitative (ql)
Plan	Market research and forecasting ability (MR)	Accuracy of earlier forecasts	QN, Q
		Cost of market research	QN, C
		Quality of data collection	QL, Q
		Forecasting Time	QN, T
	Product research and development resources (RD)	R & D Team	QL, Q
		Product development cycle time	QN, T
		Autonomy of R& D effort	QL, Q
		Average cost of new product Development	QN, C
	Flexibility practice & feedback (FP)	Time taken to achieve the set target	QN, T
		Cost incurred to achieve set target	QN, C
		Degree to which set objective is achieved	QL, Q
Source	Relationship with vendors (VR)	Average time taken by vendor to respond	QN, T
		Response to changes in order	QL, Q
		Supplier assistance in solving technical problems	QL, Q

Supply Chain link	Contributing attribute	Contributing taxonomy of performance measure	Type of measure: Cost (c); Time (t); Quality (q) Quantitative (qn); Qualitative (ql)
	Cost of changing suppliers (CS)	Cost of changing suppliers	QN, C
		Time for new supplier to be effective	QN, T
	Cost of changing inventory (CI)	Cost of changing inventory	QN, C
	Material flexibility (MF)	Cost of change in material	QN, C
		Time to effect changes	QN, T
	Supply logistics (SL)	Cost of changing mode of transport	QN, C
		Time to effect change in logistics	QN, T
		Effect on quality of supply due to change in logistics	QL, Q
Make	Multiple production facility (MP)	Additional cost of multiple production facilities	QN, C
		Time to effect changes in production location	QN, T
		Cost of changing volume of production	QN, C
	Outsourcing (OS)	Additional cost of outsourcing	QN, C
		Availability of outsourcing agencies	QL, Q
	Multi-skill of employees (MS)	Level of Multi-skill ability of employees	QL, Q
		Cost of Multi- skill training	QN, C
		Time to effect shifting of employee to new role	QN, T
	Postponement of final assembly (PA)	Reduction in inventory due to postponement	QN, Q
		Change in delivery time due to postponement	QN, T
		Variety offered in final product	QN, Q
	Machine flexibility (MM).	Level of machine flexibility	QL, Q
		Product variety achieved due to machine flexibility	QN, Q
		Time to change machine settings for new product specification	QN, T
	Process flexibility (PF)	Time to effect process change	QN, T
		Design for process flexibility	QL, Q
		Cost of process change	QN, C

Supply Chain link	Contributing attribute	Contributing taxonomy of performance measure	Type of measure: Cost (c); Time (t); Quality (q) Quantitative (qn); Qualitative (ql)
Deliver	Ability to shift transportation, volume & mix transported (ST)	Availability of alternate modes of transportation	QL, Q
		Time to effect changes in volume and mix transported	QN, T
	Change in response time when order changes (RT)	Time to effect changes in order	QN, T
	Cost for order changes (CO)	Cost to effect changes in order	QN, C
	Responsiveness to urgent orders (UO)	Readiness of logistic partners to respond to order changes	QL, Q
		Response time for urgent orders	QN, T
		Cost of logistics for urgent orders	QN, C

6.3 Prioritising the Contribution of Flexibility Performance Measures

The Analytic Hierarchy Process (AHP) is a general problem solving method that is useful in making complex decisions (e.g. multi criteria decisions) based on variables that do not have exact numerical consequences (Saaty, 2008). The AHP methodology is explained in Chapter 3.

6.3.1 AHP hierarchy model

The first step in AHP is decomposing the problem into a hierarchy of criteria and alternatives. Based on the proposed Framework for Flexibility Performance Measurement in SCs (refer Figure 6.2) the ‘Goal’ and ‘Levels’ of criteria are selected and an AHP hierarchy model has been prepared. The hierarchy model consists of the ‘goal’ at the top, the contributing levels of criteria (depicted as ‘Level 1 Criteria’ and ‘Level 2 Criteria’) and ‘Alternatives’. The present study is limited to Level 2 criteria. The AHP analysis can be further expanded to Level 3 criteria by incorporating the contributing performance measures listed at the taxonomy placed at Table 6.1. The hierarchy modelling for Flexibility Performance Measurement framework in SCs is shown at Figure 6.4.

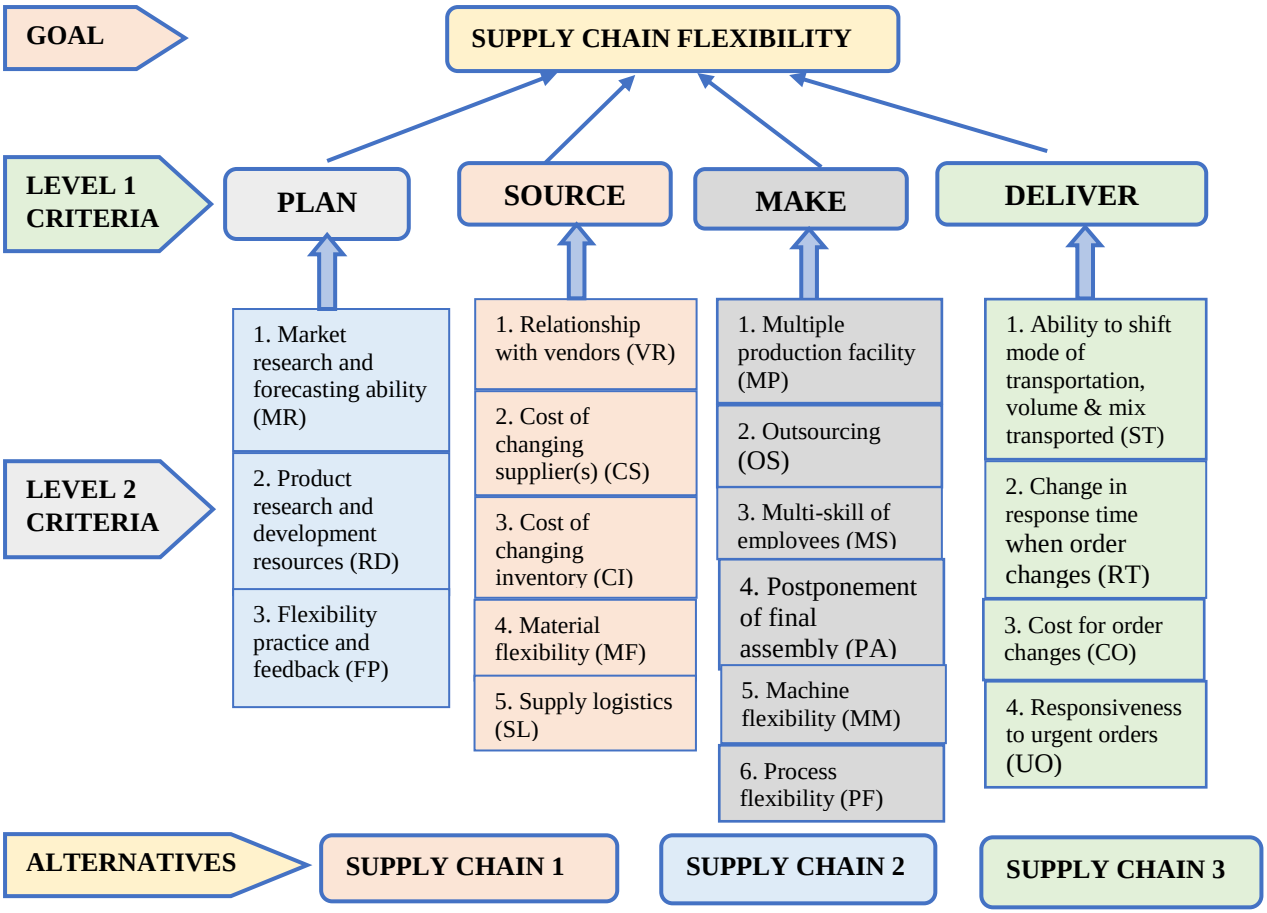

Figure 6.4 AHP Hierarchy Model for Flexibility Performance Measurement

6.3.2 Establishing priorities

After decomposing model into levels of criteria and building the hierarchy, the next step is generating the priority matrix for each level of criteria. For each level of Criteria, by *'Paired Comparison*' and by using '*Comparison Values'*, '*Comparison Matrix'* is generated. For the 'Paired Comparison' and assigning value based on paired comparison, a 0 to 9 scale with its reciprocal values is the standard used for AHP analysis (Saaty, 2008). The paired comparison and comparison matrix is generated based on expert opinion generated through Delphi method. The values used in the present work are representative data for a generic SC. Since 'Comparison Matrix' forms part of the 'Eigen Matrix' the 'Comparison Matrices' are not shown separately but included along with Eigen Matrix and shown at Table 6.2.

6.3.3 Generation of Eigen vectors

Based on the 'comparison matrix', Eigen vectors are calculated for each level of criteria. The Eigen vector represents the Priority Measure of each criterion. Consistency of comparative matrices are checked to see whether the 'paired comparisons' are logical and whether the paired comparisons made are consistent. The condition for consistency is that Consistency Ratio (CR) < 10% (Forman & Gass, 2001; Saaty, 2008). CR is calculated based on equations given at Eq. 6.1 to Eq. 6.3.

$$CR = \frac{CI}{RI} \tag{6.1}$$

$$CI = \frac{\lambda_{\max} - n}{(n-1)} \tag{6.2}$$

$$\lambda_{ma} = \sum (Sum\ of\ column\ values \times Eigen\ vector\ element) \tag{6.3}$$

Where:

CR = Consistency Ratio, RI = Random Consistency Index, *n* = Order of the matrix

λ_{max} = Principal Eigen Value

Random Consistency Index (RI) values are taken from the *Random Consistency Index Table* (Table 6.2). The AHP Calculation software by CGI has been used to generate the Eigen vectors. Eigen vectors generated, and the Priority Matrices for Level 1 and Level 2 of criteria are calculated and shown at Table 6.3. The calculated λ_{max}**,** CI and CR values are also shown at Table 6.3.

A detailed discussion on creation of the comparison matrix and sample calculations are presented in Chapter 3, section 3.4.

Table 6.2 Random Consistency Index Table (source: Saaty, 2008)

ORDER OF MATRIX	1	2	3	4	5	6	7	8	9
RI value	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45

Table 6.3 Eigen Matrix for Level 1 and Level 2 Criteria

Eigen Matrix for Level 1 Criteria					
	Plan	**Source**	**Make**	**Deliver**	**Eigen Vector**
Plan	1	1/2	1/3	1/2	0.1233
Source	2	1	2	2	0.4197
Make	3	1/2	1	2	0.2892
Deliver	2	1/2	1/2	1	0.1678
λmax = 4.143; C.I.= 0.0477; CR = 0.05301					

Eigen Matrix for Level 2 Criteria: Plan				
	MR	**RD**	**FP**	**Eigen Vector**
Market research and forecasting ability (MR)	1	1/5	1/7	0.0719
Product research and development resources (RD)	5	1	1/3	0.2790
Flexibility practice & feedback (FP)	7	3	1	0.6491
λmax = 3.064; C.I.= 0.0324; CR = 0.05586				

Eigen Matrix for Level 2 Criteria: Source						
	VR	**CS**	**CI**	**MF**	**SL**	**Eigen Vector**
Relationship with vendors (VR)	1	1/3	1/2	1/3	1/2	0.0864
Cost of changing suppliers (CS)	3	1	3	3	1	0.3351
Cost of changing inventory (CI)	2	1/3	1	1/3	1/3	0.1037
Material flexibility (MF)	3	1/3	3	1	1/2	0.1928
Supply logistics (SL)	2	1	3	2	1	0.2821
λmax = 5.2696; C.I.= 0.0674; CR = 0.06017						

Eigen Matrix for Level 2 Criteria: Make							
	MP	**OS**	**MS**	**PA**	**MM**	**PF**	**Eigen Vector**
Multiple production facility (MP)	1	3	3	4	2	2	0.3078
Outsourcing (OS)	1/3	1	2	3	1/3	1/2	0.1093
Multi-skill of employees (MS)	1/3	1/2	1	2	1/3	1/3	0.0766
Postponement of final assembly (PA)	1/4	1/3	1/2	1	1/3	1/3	0.0553
Machine flexibility (MM)	1/2	3	3	3	1	5	0.2994
Process flexibility (PF)	1/2	3	3	3	1/5	1	0.1516
λmax = 6.4619; C.I.= 0.09238; CR = 0.0745							

Eigen Matrix for Level 2 Criteria: Deliver					
	ST	**RT**	**CO**	**UO**	**Eigen Vector**
Ability to shift transportation, volume & mix transported (ST)	1	2	3	3	0.4430
Change in response time when order changes (RT)	1/2	1	2	3	0.2783
Cost for order changes (CO)	1/3	1/2	1	3	0.1828
Responsiveness to urgent orders (UO)	1/3	1/3	1/3	1	0.0959
λmax = 4.1431; C.I.= 0.0477; CR = 0.053					

6.3.4 Generation of weightings of flexibility measures

The weighting of the flexibility measures is obtained by normalizing individual Eigen Matrices. The Normalized Priority Matrix values (weightings) are calculated such that the values of sub criteria are within the weight of its corresponding higher criteria (Parent Criteria). Table 6.4 shows the Normalized Priority Matrix. The normalized Eigen Vector values are

obtained by multiplying the Eigen Vector values of *Flexibility Performance Measure* (level 2 Criteria) with Eigen Vector Value of its corresponding *SUPPLY CHAIN link* (level 1 criterion).

Example;

Normalized Eigen Vector value in percentage for the measure '*Relationship with vendors (VR)*' = Eigen Vector value for '*Source' (0.4197*) x Eigen Vector value for '*Relationship with vendors (VR)' (0.0864*) x 100 = 3.63 %.

The result (normalized Eigen Vector values) indicates the weighting of each criterion. These values provide a quantitative indication of how much each criterion is contributing towards achieving SC Flexibility. For example, *Market research and forecasting ability (MR)* has a contribution of 0.89% whereas *Product research and development resources (RD)* has a contribution of 3.44% towards achieving flexibility in the SC considered.

Table 6.4 Normalized Priority Matrix Showing Weighting of Flexibility Measures

Supply Chain Link (Level 1 Criteria)	**Flexibility Performance Measure (Level 2 Criteria)**	**Eigen Vector of Level 1 Criteria**	**Eigen Vector of Level 2 Criteria**	**Normalized Eigen Vector (Weighting of Performance Measure in %)**
Plan	Market research and forecasting ability (MR)	0.1233	0.0719	**0.89**
	Product research and development resources (RD)		0.2790	**3.44**
	Flexibility practice & feedback (FP)		0.6491	**8.00**
Source	Relationship with vendors (VR).	0.4197	0.0864	**3.63**
	Cost of changing suppliers (CS).		0.3351	**14.06**
	Cost of changing inventory (CI).		0.1037	**4.35**
	Material flexibility (MF).		0.1928	**8.09**
	Supply logistics (SL).		0.2821	**11.84**
Make	Multiple production facility (MP)	0.2892	0.3078	**8.90**

Supply Chain Link (Level 1 Criteria)	Flexibility Performance Measure (Level 2 Criteria)	Eigen Vector of Level 1 Criteria	Eigen Vector of Level 2 Criteria	Normalized Eigen Vector (Weighting of Performance Measure in %)
	Outsourcing (OS).		0.1093	**3.16**
	Multi-skill of employees (MS).		0.0766	**2.21**
	Postponement of final assay (PA).		0.0553	**1.60**
	Machine flexibility (MM).		0.2994	**8.66**
	Process flexibility (PF)		0.1516	**4.38**
Deliver	Ability to shift transportation, volume & mix transported (ST)	0.1678	0.4430	**7.43**
	Change in response time when order changes (RT)		0.2783	**4.67**
	Cost for order changes (CO)		0.1828	**3.07**
	Responsiveness to urgent orders (UO)		0.0959	**1.61**

6.4 Results and Discussions

The flexibility performance measurement framework is formulated around the four links of the SC, viz. *plan, source, make* and *deliver.* The four links essentially incorporate the gamut of a generic SC. 'Flexibility objectives' and 'contributing attributes' at each of these links are identified and enumerated to form the performance measurement framework. The framework provides an insight to 'flexibility objectives' and its 'contributing attributes' at each level of the SC and provides clarity to the decision maker. The taxonomy of flexible performance measures is based on extensive literature review and based on expert opinion. These measurable indices are categorized as 'cost', 'time' and 'quality' measures.

After arriving at the 'flexibility objectives' and the 'measures', a methodology to prioritize and quantify the contribution of each of these measures to achieve the 'objectives' is demonstrated using AHP. The decision maker can thus allot resources more judiciously based on the contribution of each criterion in achieving the objectives. The data used for the AHP

procedure is sourced from expert opinion for a generic SC. Therefore, numerical value of weightings obtained (refer Table 6.4) may not be significant for a specified SC and there will be a need to generate data for that specific SC. Flexibility Performance Measurement Framework together with the contribution in percentage of each criterion is given at Figure 6.5.

The result analysis at Table 6.4 and Figure 6.5 indicates that the highest contributing *Flexibility Performance Measure* is 'Cost of changing suppliers (CS)' whose contribution to SC flexibility is 14.06%. This is followed by 'Supply logistics (SL)' whose contribution is 11.84%. The ranking of the flexibility performance measures obtained through the AHP process is tabulated at Table 6.5. Following inferences can be derived from the results obtained:

1. The flexibility requirement at the four links of the SC (Plan, Source, Make and Deliver) are not equal. The result indicates that highest flexibility requirement is at the Sourcing activities (41.9%) and minimum at 'Planning' (12.33%).

2. The wide range of the weightings, from 14.06% to 0.89% is indicative of the highly varying contribution of individual Performance Measures towards achieving flexibility across the four links of the SC.

3. These results will help in monitoring and control of resource allocation to achieve different levels of flexibility.

4. A history of these measures helps to monitor and observe how the flexibility measures are changing over a period. These measures can also be used to compare and benchmark flexibility of similar or identical SCs.

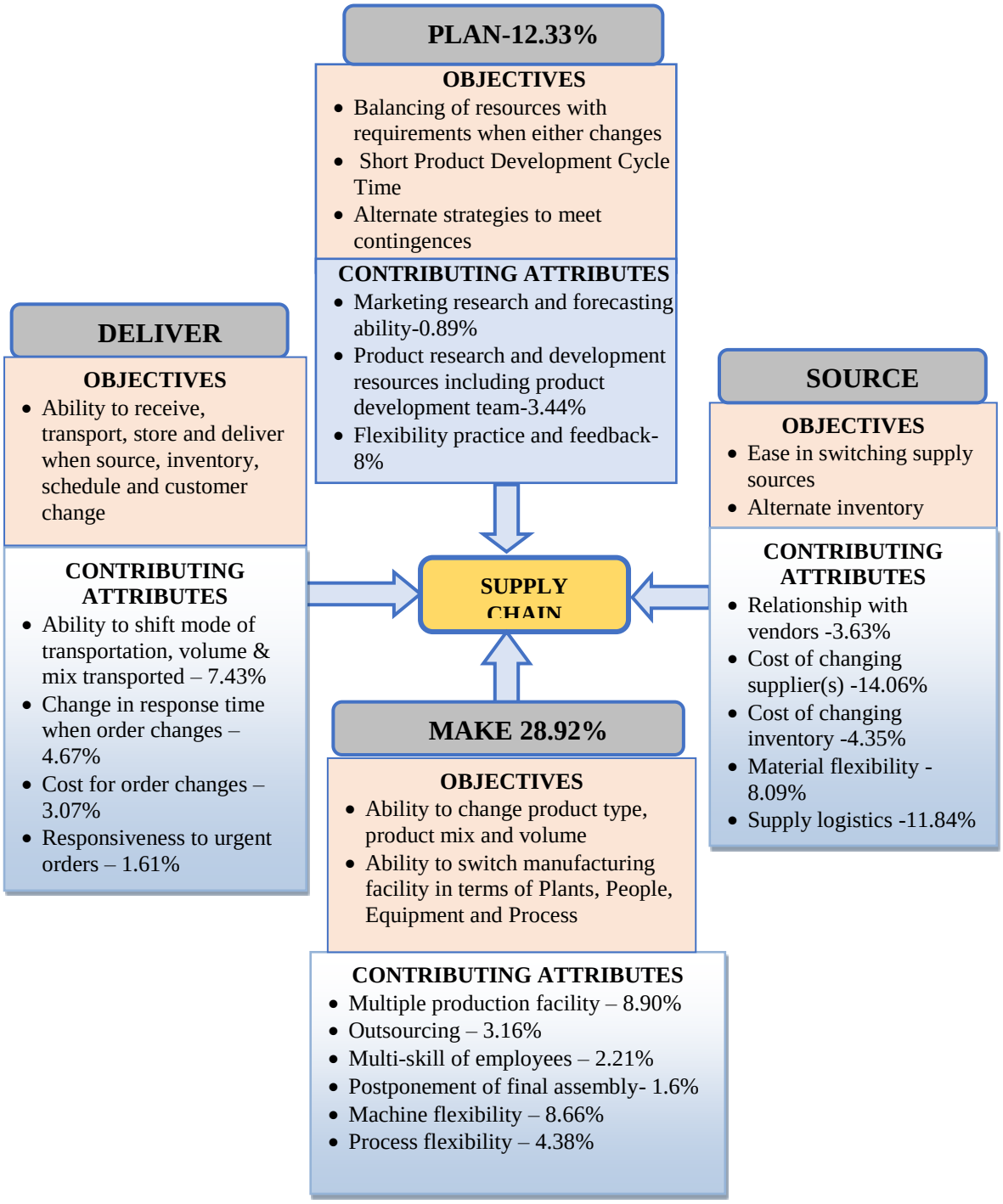

Figure 6.5 Framework for Flexibility Performance Measurement in SC with Percentage contribution of each Criterion

Table 6.5 Ranking of the Flexibility Performance Measures

RANK	FLEXIBILITY PERFORMANCE MEASURE	WEIGHTING OF PERFORMANCE MEASURE IN %	RELATED SC LINK
1	Cost of changing suppliers (CS)	14.06	Source
2	Supply logistics (SL)	11.84	Source
3	Multiple production facility (MP)	8.9	Make
4	Machine flexibility (MM)	8.66	Make
5	Material flexibility (MF)	8.09	Source
6	Flexibility practice & feedback (FP)	8	Plan
7	Ability to shift transportation, volume & mix transported (ST)	7.43	Deliver
8	Change in response time when order changes (RT)	4.67	Deliver
9	Process flexibility (PF)	4.38	Make
10	Cost of changing inventory (CI)	4.35	Source
11	Relationship with vendors (VR)	3.63	Source
12	Product research and development resources (RD)	3.44	Plan
13	Outsourcing (OS)	3.16	Make
14	Cost for order changes (CO)	3.07	Deliver
15	Multi-skill of employees (MS)	2.21	Make
16	Responsiveness to urgent orders (UO)	1.61	Deliver
17	Postponement of final assay (PA)	1.6	Make
18	Market research and forecasting ability (MR)	0.89	Plan
	Total	**100.00**	

6.5 Conclusion

A new framework for the analysis and measurement of SC flexibility is proposed in the present Chapter. A set of *'flexibility objectives'* and '*contributing attributes'* at each four-identified links of the SC viz. *Plan, Source, Make* and *Deliver* constitutes the proposed framework for flexibility performance measurement making it a channel-spanning PMS. The taxonomy of flexible performance measures proposed in this study is a set of measurable performance indices related to each of the contributing attributes. The taxonomy of the performance measure will help in arriving at numerical values of the Flexibility attributes. The proposed framework is in line with earlier research in this area and captures the essence of organisational flexibility performance in a SC context.

A methodology to prioritise the contribution of each performance attribute to achieve the desired flexibility objective using AHP has also been proposed and demonstrated in this Chapter. The AHP based procedure facilitates prioritisation of performance measures and corresponding weightings to the identified flexibility indices.

The managerial implications of the study include providing a generic tool and methodology to measure, monitor and control flexibility in SC context. The manager can thus prioritise resource allocation to achieve desired level of flexibility at the different links of the SC. The performance measurement framework can also extend to compare performances with past, compare flexibility performance with other similar SCs and set benchmarks.

The proposed framework is a conceptual model based on existing performance measurement frameworks, related literature and expert opinion. The research does not test the model but suggests a platform for further development and implementation.