CHAPTER 6
VALIDATION OF HUMAN BODY INSPIRED
MODEL OF ORGANIZATIONAL
EXCELLENCE

6.1 Introduction
The model proposed in the previous chapter is developed to show new and powerful directions to managers in organization management. However, the present model is developed with the opinion of few experts and therefore need empirical evidence for wider acceptance. Therefore this chapter is aimed to validate the conceptual framework developed in the previous chapter. Model validation has been done by taking unified confirmation of experienced management practitioners on various parameters of the conceptual model. Thereafter the model has been converted into a workable instrument for organizational self assessment. Besides, model efficacy has been checked by testing it on two well known companies, results of which were also compared with results obtained from EFQM model for organizational excellence assessment. Moreover, it is expected that a self assessment of businesses on the parameters of the model would indicate areas of improvement for achieving organizational excellence. Various techniques like Structural Equation Modeling (SEM), Analytic Hierarchy Process (AHP) have been used in this paper.

6.2 Objectives and techniques used
The aim of this chapter is to test and validate the human body inspired model of organizational excellence model developed in previous chapter inspired from human body. The overall objective of this chapter is planned to be achieved through following sub-objectives:

i. To empirically validate the model for wider acceptance. Exploratory Factor Analysis (EFA) and Structural Equation Modeling (SEM) were used for empirical validation.

6.1* This chapter will be published in the form of research paper titled “A Bio-inspired model of organizational excellence” in vol. 13, no. 2 (June 2016) of Journal of Advances in Management Research.
ii. To determine relative importance of the enablers, the Analytic Hierarchy Process (AHP) has been used to quantify the relative priorities of the human body organization enablers based on expert opinion.

iii. To evaluate the efficacy of the proposed model by testing it on few organizations.

6.3 Model validation

Following section is aimed at presenting the research design for empirical validation the proposed model.

6.3.1 Research design

The focus of present research work is to investigate the relationships among the enablers in human body for organization excellence. Since present research work is based on primary data which would be collected from corporate managers, a field based survey design is used as the data collection method.

6.3.1.1 Formulation of hypothesis

The research model to be tested in this study is shown in Figure 6.1. This model also shows the hypothesized relationships among the constructs included in the present study, such as; promptness, coordination, effective communication, supply chain optimization, innovation, sustained change management, self driven, process control, and reliability & maintainability.

Figure 6.1: Conceptual model for the study
All hypotheses are based on final relationship suggested in TISM model of human body organization. Relevant research hypothesis for each relationship are compiled in Table 6.1.

Table 6.1: List of Hypothesis to be tested

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Null hypothesis</th>
<th>Alternate hypothesis</th>
<th>Hypothesized relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H1a₀. There is no relationship between self driven and coordination</td>
<td>H1a₁. Self driven will have a significant positive affect on coordination</td>
<td>SD --&gt; COD</td>
</tr>
<tr>
<td>2</td>
<td>H1b₀. There is no relationship between self driven and sustained change management</td>
<td>H1b₁. Self driven will have a significant positive affect on sustained change management</td>
<td>SD --&gt; SCNG</td>
</tr>
<tr>
<td>3</td>
<td>H1c₀. There is no relationship between self driven and process control</td>
<td>H1c₁. Self driven will have a significant positive affect on process control</td>
<td>SD --&gt; PC</td>
</tr>
<tr>
<td>4</td>
<td>H1d₀. There is no relationship between self driven and, reliability &amp; maintainability</td>
<td>H1d₁. Self driven will have a significant positive affect on reliability &amp; maintainability</td>
<td>SD --&gt; R&amp;M</td>
</tr>
<tr>
<td>5</td>
<td>H2a₀. There is no relationship between coordination and innovation</td>
<td>H2a₁. Coordination will have a significant positive affect on innovation</td>
<td>COD --&gt; INNO</td>
</tr>
<tr>
<td>6</td>
<td>H2b₀. There is no relationship between coordination and communication</td>
<td>H2b₁. Coordination will have a significant positive affect effective communication</td>
<td>COD --&gt; COMM</td>
</tr>
<tr>
<td>7</td>
<td>H2c₀. There is no relationship between coordination and sustained change management</td>
<td>H2c₁. Coordination will have a significant positive affect on sustained change management</td>
<td>COD --&gt; SCNG</td>
</tr>
<tr>
<td>8</td>
<td>H3a₀. There is no relationship between innovation and effective communication</td>
<td>H3a₁. Innovation will have a significant positive effect on effective communication</td>
<td>INNO --&gt; COMM</td>
</tr>
<tr>
<td>S. No.</td>
<td>Null hypothesis</td>
<td>Alternate hypothesis</td>
<td>Hypothesized relationship</td>
</tr>
<tr>
<td>-------</td>
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</tr>
<tr>
<td>9</td>
<td>H3b₀. There is no relationship between innovation and reliability &amp; maintainability</td>
<td>H3b₁. Innovation will have a significant positive effect on reliability &amp; maintainability</td>
<td>INNO --&gt; R&amp;M</td>
</tr>
<tr>
<td>10</td>
<td>H3c₀. There is no relationship between innovation and sustained change management</td>
<td>H3c₁. Innovation will have a significant positive effect on sustained change management</td>
<td>INNO --&gt; SCNG</td>
</tr>
<tr>
<td>11</td>
<td>H4a₀. There is no relationship between effective communication and sustained change management</td>
<td>H4a₁. Effective communication will have a positive significant effect on sustained change management</td>
<td>COMM --&gt; SCNG</td>
</tr>
<tr>
<td>12</td>
<td>H4b₀. There is no relationship between effective communication and supply chain optimization</td>
<td>H4b₁. Effective communication will have a positive significant effect on supply chain optimization</td>
<td>COMM --&gt; SCO</td>
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<tr>
<td>13</td>
<td>H4c₀. There is no relationship between effective communication and promptness</td>
<td>H4c₁. Effective communication will have a positive significant effect on promptness</td>
<td>COMM --&gt; PROP</td>
</tr>
<tr>
<td>14</td>
<td>H5a₀. There is no relationship between sustained change management and process control</td>
<td>H5a₁. Sustained change management will have a significant positive effect on process control</td>
<td>SCNG --&gt; PC</td>
</tr>
<tr>
<td>15</td>
<td>H5b₀. There is no relationship between sustained change management and promptness</td>
<td>H5b₁. Sustained change management will have a significant positive effect on promptness</td>
<td>SCNG --&gt; PROP</td>
</tr>
<tr>
<td>16</td>
<td>H6₀. There is no relationship between supply chain optimization and promptness</td>
<td>H6₁. Supply chain optimization will have a significant positive effect on promptness</td>
<td>SCO --&gt; PROP</td>
</tr>
</tbody>
</table>
Table 6.1: List of Hypothesis to be tested

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Null hypothesis</th>
<th>Alternate hypothesis</th>
<th>Hypothesized relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>H7a0. There is no relationship between process control and reliability &amp; maintainability</td>
<td>H7a1. Process control in an organization significantly facilitates reliability &amp; maintainability</td>
<td>PC --&gt; R&amp;M</td>
</tr>
<tr>
<td>18</td>
<td>H7b0. There is no relationship between process control and supply chain optimization</td>
<td>H7b1. Process control in an organization significantly facilitates supply chain optimization</td>
<td>PC --&gt; SCO</td>
</tr>
<tr>
<td>19</td>
<td>H8a0. There is no relationship between reliability &amp; maintainability, and promptness</td>
<td>H8a1. Reliability &amp; maintainability will have a significant positive affect on promptness</td>
<td>R&amp;M --&gt; PROP</td>
</tr>
</tbody>
</table>

6.3.1.2 Construction of instrument for data collection

As stated earlier, in this research, survey methodology has been used to investigate the hypotheses. Data were collected through a structured questionnaire with closed-ended questions. Objective of the questionnaire is to translate the information needed into specific set of questions. The questionnaire was split into two sections. First section was designed to know the demographic profile of the respondents, whereas the questions in the second section were intended to investigate the hypothesized relationship among the enablers and the association of various parameters with the respective enabler. The responses on each item of second section were measured on 5 – point Likert’s scale. Items in the questionnaire were framed based on the parameters under each enabler. In all, there were total 42 items (7 in section A and 35 in B) in the questionnaire. These parameters were identified in previous chapter of the thesis and are compiled in Table: 6.2.
<table>
<thead>
<tr>
<th>Construct</th>
<th>Related items in the questionnaire</th>
<th>Code</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self driven (SD)</td>
<td>1-5</td>
<td>SD1, SD2, SD3, SD4, SD5</td>
<td>1-5</td>
</tr>
<tr>
<td>Coordination (COD)</td>
<td>6-11</td>
<td>COD1, COD2, COD3, COD4, COD5, COD6</td>
<td>1-5</td>
</tr>
<tr>
<td>Innovation (INNO)</td>
<td>12-14</td>
<td>INNO1, INNO2, INNO3</td>
<td>1-5</td>
</tr>
<tr>
<td>Effective communication (COMM)</td>
<td>15-17</td>
<td>COMM1, COMM2, COMM3</td>
<td>1-5</td>
</tr>
<tr>
<td>Sustained change management (SCNG)</td>
<td>18-20</td>
<td>SCNG1, SCNG2, SCNG3</td>
<td>1-5</td>
</tr>
<tr>
<td>Supply chain optimization (SCO)</td>
<td>21-23</td>
<td>SCO1, SCO2, SCO3</td>
<td>1-5</td>
</tr>
<tr>
<td>Process control (PC)</td>
<td>24-26</td>
<td>PC1, PC2, PC3</td>
<td>1-5</td>
</tr>
<tr>
<td>Promptness (PROP)</td>
<td>27-30</td>
<td>PROP1, PROP2, PROP3, PROP4</td>
<td>1-5</td>
</tr>
<tr>
<td>Reliability &amp; maintainability (R&amp;M)</td>
<td>31-35</td>
<td>R&amp;M1, R&amp;M2, R&amp;M3, R&amp;M4, R&amp;M5</td>
<td>1-5</td>
</tr>
</tbody>
</table>

Before finalizing the questionnaire, it was discussed with experts in survey and questionnaire design [220]. They have checked it for various issues like wording of items (uncommon word and technical jargon), ambiguity, leading question, intrusiveness, faking good etc. They have also checked that whether the concepts and indicators intended to seek are compatible with what the respondent could conceive [233]. The questionnaire developed was finalized after incorporating their comments and suggestions. Refer Appendix 3 for the questionnaire.

### 6.3.1.3 Sampling

Since the major focus of this study was to investigate the enablers of organizational excellence and their interrelationships, therefore, the target population for this research consists of subjects, who have rich experience in corporate management. Judgmental sampling is used to develop sampling frame, wherein corporate managers with more than 5 years of experience were considered.
6.3.1.4 Sample size determination

In case of exploratory factor analysis, more acceptable sample size should have a 10:1 ratio [149]. In this study, there are 35 parameters, so sample size should be 35*10 i.e. 350 respondents. In Structural Equation Modeling as a rule of thumb, any number above 200 (critical sample size) is considered to provide sufficient statistical power for data analysis [163, 164]. The process of determining the proper sample size is established through a series of calculations and after obtaining all the possible sample sizes, the largest one was taken into consideration to collect the closest number to a representative sample of the population. Therefore, targeted sample size was 350 respondents.

6.3.1.5 Data collection

Data were collected through structured questionnaire from respondents who are managers with more than 5 years of corporate experience. Sampling frame is chosen from multiple sources like directory of corporate firms in India, from website of firms, as well as through personal contacts. A pilot study was conducted to ascertain the suitability of the research instrument (n=70). Reliability check was performed to know the suitability of the construct for this industry. After ascertaining the suitability of construct, 500 questionnaires are distributed personally and through mails. A total of 380 responses were received. Out of these, the incomplete questionnaires were kept out of study, and only 301 are found usable. Since pilot study results were in the favor of the construct, those responses were also included in the sample. Therefore total sample size for the study becomes 371. To keep the confidentiality of the data, the names of the respondents are not mentioned in the study.

6.3.2 Data analysis and presentation of findings

6.3.2.1 Pilot study

A pilot study was conducted to detect weakness in the design and survey instrument and to provide proxy data for selection. Also, the instrument was pilot tested in order to assess the psychometric properties of the measures. In this research, 70 questionnaires (20% of the total sample) were sent to the respondents for pilot testing [22]. The reliability of the items used in the questionnaire was assessed using the internal consistency test Cronbach’s alpha. This is a test of the consistency of the respondent’s answers to all the items in the questionnaire. Cronbach’s alpha estimate value above 0.70 is considered as acceptable [235]. According to Sekaran [293], if the value of Cronbach’s alpha reliabilities is less than 0.6, they are considered as poor, if
the value is in 0.7 they are acceptable, and the reliabilities value above 0.8 are considered good. Therefore, the closer the Cronbach’s alpha gets to 1.0 the better is the reliability. In this study it is found to be 0.875, which is evidence of the reliability of the instrument.

6.3.2.2 General sample description

As the demographic profile of the respondents’ are likely to influence their opinion on the variables under study, the questionnaire included a section on it. A demographic profile of the respondents consisted of age, gender, educational qualifications, work experience and current designation. Table 6.3 represents the demographic characteristics of the respondents.

Table 6.3: General sample description

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Variable</th>
<th>Levels</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Age</td>
<td>20-30</td>
<td>52</td>
<td>14.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>31-40</td>
<td>123</td>
<td>33.15</td>
</tr>
<tr>
<td></td>
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<td>41-50</td>
<td>98</td>
<td>26.42</td>
</tr>
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<td>51-60</td>
<td>51</td>
<td>13.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60&lt;</td>
<td>47</td>
<td>12.67</td>
</tr>
<tr>
<td>3</td>
<td>Gender</td>
<td>Male</td>
<td>297</td>
<td>80.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>74</td>
<td>19.95</td>
</tr>
<tr>
<td>4</td>
<td>Education</td>
<td>Diploma</td>
<td>0</td>
<td>0.00</td>
</tr>
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<td></td>
<td></td>
<td>Graduate</td>
<td>211</td>
<td>56.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-graduate</td>
<td>160</td>
<td>43.13</td>
</tr>
<tr>
<td>5</td>
<td>Work experience (in yrs)</td>
<td>5-10</td>
<td>59</td>
<td>15.90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-20</td>
<td>213</td>
<td>57.41</td>
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<tr>
<td></td>
<td></td>
<td>20&lt;</td>
<td>99</td>
<td>26.68</td>
</tr>
<tr>
<td>6</td>
<td>Name of the organization</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Current Designation</td>
<td>Vary from senior managers to DGM</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
6.3.2.3 Preliminary data analysis

Preliminary data analysis has been done using SPSS 16.0 and AMOS 16.0. It includes treatment of missing data, identification of outliers (Mahalanobis d-squared test) and finding out the data normality (using kurtosis and skewness statistics).

Missing data

Missing data are a very common problem in all types of survey based research [54]. Hair et al. [149] note that missing data cause two main problems: (a) it minimizes the ability of statistical test to imply a relationship in the data set, and (b) it creates biased parameter estimates. Kline [185] suggested that missing values should probably constitute less than 10% of the total data. According to Cohen and Cohen [77], 5% or even 10% of missing data on a particular variable is not large. In the present study, there is about 3% missing data and the pattern of missing data is found random. Considering the low percentage and randomness of missing values, they are replaced with the average values using SPSS 16.0 [149].

Outliers

Kline [185] and Hair et al. [149] described outliers as cases with scores that are distinctively different from rest of the observations in a data set. Researchers have warned that problematic outliers can have dramatic effects on the statistical analysis such as model fit estimates and parameter estimates [368] and they can create a negative variance [104]. Presence of multivariate outliers in data can be checked by Mahalanobis d-squared test, which is a measure of distance in standard deviation units between each observation compared with the mean of all observations [58, 149, 185]. A large d-square identifies the case as an extreme value. A very conservative statistical significance test such as p < 0.001 is recommended to be used with d-square measure [149, 185]. In this research study, Mahalanobis distance is measured using AMOS version 16.0. There are few cases with Mahalanobis d-squared at p < 0.001, however upon closer inspection they proved to be valid data points and, therefore, were retained in the data set.

Normality

Normality is defined as the "shape of the data distribution or an individual metric variable and its correspondence to the normal distribution, which is the benchmark for statistical methods" [149]. Violation of normality might affect the estimation process or the interpretation of results especially in SEM analysis. For instance, it may increase the chi-square value and may possibly cause underestimation of fit indices.
and standard errors of parameter estimates [149]. Normality can be inspected by two multivariate indexes i.e. skewness and kurtosis. The skewness portrays the symmetry of distribution whereas the kurtosis refers to the measure of the heaviness of the tails in a distribution (also known as peakedness or flatness of the distribution) compared with the normal distribution. In normal distribution, the scores of skewness and kurtosis are zero. Hair et al [149] point out that skewness scores outside the -1 to +1 range demonstrate substantially skewed distribution. However, West et al. [368] and Kline [185] suggest that values of the skew index greater than three (3.0) are indicated as extremely skewed and score of the kurtosis index from about 8.0 to over 20.0 describe extreme kurtosis. In this study, the results of test of normality lie within the acceptable range i.e. ±3 for the skewness and up to ±10 for the kurtosis.

6.3.2.4 Exploratory Factor Analysis

In this research study, exploratory factor analysis (EFA) has been applied to examine the dimensions of each construct (herein called as a factor). It involves identifying latent dimensions of the structure of the data and then determines the degree to which a test item (variable) is explained by each factor [149]. Using SPSS version 16.0, Principal Component Analysis (PCA) is carried out to examine the underlying factors associated with the items.

The constructs validity is tested applying Bartlett’s Test of Sphericity and the Kaiser–Mayer–Olkin (KMO) measure of sampling adequacy analyzing the strength of association among variables. The KMO measure of sampling adequacy was computed first to determine the suitability of using factor analysis. It helps to predict whether data are suitable to perform factor analysis. Result of the Bartlett’s test of Sphericity and the KMO (Table: 6.4) for all constructs revealed that both were highly significant and eventually concluded that these variables were suitable for the factor analysis.
The exploratory factor analysis of the enablers of human body performance resulted into nine factors with Eigen values more than 1 and explains 51.2% variance. To determine the minimum loading necessary to include an item in its respective constructs, Hair et al. [149] suggested that variables with loading greater than 0.30 are considered significant, loading greater than 0.40 more important, and loading 0.50 or greater are very significant. For this study, the general criteria were accepted for items with loading of 0.30 or greater. Following this principle resulted in elimination of three variables i.e. SCO 2, SCO 3, and PC 3 (Table 6.5).
Table 6.5: Rotated matrix for human body enablers

<table>
<thead>
<tr>
<th>Items</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>COD1</td>
<td>0.634</td>
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<td></td>
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<td></td>
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<tr>
<td>SCO1</td>
<td></td>
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<td></td>
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<td>SCO2</td>
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<td></td>
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<tr>
<td>SCO3</td>
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<tr>
<td>COMM1</td>
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<td></td>
</tr>
<tr>
<td>INNO1</td>
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<td></td>
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<tr>
<td>R&amp;M1</td>
<td></td>
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<tr>
<td>SD3</td>
<td>0.719</td>
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<tr>
<td>COD6</td>
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<td></td>
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<tr>
<td>R&amp;M2</td>
<td>0.58</td>
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<tr>
<td>COMM3</td>
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<tr>
<td>SD4</td>
<td>0.354</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>R&amp;M4</td>
<td></td>
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<tr>
<td>R&amp;M5</td>
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<td></td>
</tr>
<tr>
<td>INNO2</td>
<td></td>
<td></td>
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<td></td>
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<td>PC1</td>
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<td></td>
<td></td>
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<tr>
<td>INNO3</td>
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<td></td>
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<td></td>
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<tr>
<td>PC3</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization; Rotation converged in 31 iterations.
The values in the Table 6.5 indicate the affiliation of the items to a factor. The higher loading (factor) indicates the stronger affiliation of an item to a specific factor. The findings of this study indicate that all of the items are homogeneously loaded on nine different factors. Five items are found to be cross-loaded on two factors. But, such items are considered under the factor for which their loading is higher than others. Thus each of the items is now loaded onto one of the nine different factors as shown in Table 6.6.

Table 6.6: Exploratory Factor Analysis Results for Human Body Enablers

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Factor</th>
<th>Name of Item</th>
<th>Eigen Value</th>
<th>% Variance Explained</th>
<th>Factor Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Self driven (SD)</td>
<td>SD1</td>
<td>5.209</td>
<td>14.883</td>
<td>0.348</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD2</td>
<td>0.515</td>
<td></td>
<td>0.515</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD3</td>
<td>0.719</td>
<td></td>
<td>0.719</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD4</td>
<td>0.354</td>
<td></td>
<td>0.354</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD5</td>
<td>0.797</td>
<td></td>
<td>0.797</td>
</tr>
<tr>
<td>2</td>
<td>Coordination (COD)</td>
<td>COD1</td>
<td>2.038</td>
<td>5.822</td>
<td>0.634</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COD2</td>
<td>0.435</td>
<td></td>
<td>0.435</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COD3</td>
<td>-0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>COD4</td>
<td>0.451</td>
<td></td>
<td>0.451</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COD5</td>
<td>0.34</td>
<td></td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COD6</td>
<td>0.58</td>
<td></td>
<td>0.58</td>
</tr>
<tr>
<td>3</td>
<td>Reliability &amp; maintainability (R&amp;M)</td>
<td>R&amp;M1</td>
<td>1.85</td>
<td>5.286</td>
<td>0.306</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R&amp;M2</td>
<td>0.514</td>
<td></td>
<td>0.514</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R&amp;M3</td>
<td>0.534</td>
<td></td>
<td>0.534</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R&amp;M4</td>
<td>0.732</td>
<td></td>
<td>0.732</td>
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<td></td>
<td>R&amp;M5</td>
<td>0.482</td>
<td></td>
<td>0.482</td>
</tr>
<tr>
<td>4</td>
<td>Innovation (INNO)</td>
<td>INNO1</td>
<td>1.748</td>
<td>4.995</td>
<td>0.498</td>
</tr>
<tr>
<td></td>
<td></td>
<td>INNO2</td>
<td>0.715</td>
<td></td>
<td>0.715</td>
</tr>
<tr>
<td></td>
<td></td>
<td>INNO3</td>
<td>0.808</td>
<td></td>
<td>0.808</td>
</tr>
</tbody>
</table>
Table 6.6: Exploratory Factor Analysis Results for Human Body Enablers

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Factor</th>
<th>Name of Item</th>
<th>Eigen Value</th>
<th>% Variance Explained</th>
<th>Factor Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Effective communication (COMM)</td>
<td>COMM1</td>
<td>1.576</td>
<td>4.502</td>
<td>0.425</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COMM2</td>
<td></td>
<td></td>
<td>0.786</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COMM3</td>
<td></td>
<td></td>
<td>0.672</td>
</tr>
<tr>
<td>6</td>
<td>Promptness (PROP)</td>
<td>PROP1</td>
<td>1.508</td>
<td>4.308</td>
<td>0.501</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PROP2</td>
<td>(-0.89)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PROP3</td>
<td></td>
<td></td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PROP4</td>
<td></td>
<td></td>
<td>0.556</td>
</tr>
<tr>
<td>7</td>
<td>Sustained change management (SCNG)</td>
<td>SCNG1</td>
<td>1.399</td>
<td>3.996</td>
<td>0.512</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCNG2</td>
<td></td>
<td></td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCNG3</td>
<td></td>
<td></td>
<td>0.778</td>
</tr>
<tr>
<td>8</td>
<td>Process control (PC)</td>
<td>PC1</td>
<td>1.38</td>
<td>3.944</td>
<td>0.337</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PC2</td>
<td></td>
<td></td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PC3</td>
<td></td>
<td></td>
<td>-0.227</td>
</tr>
<tr>
<td>9</td>
<td>Supply chain optimization (SCO)</td>
<td>SCO1</td>
<td>1.193</td>
<td>3.409</td>
<td>0.945</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCO2</td>
<td></td>
<td></td>
<td>0.168</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCO3</td>
<td></td>
<td></td>
<td>0.225</td>
</tr>
</tbody>
</table>

In this research study, exploratory factor (EFA) analysis has been first conducted to examine the underlying relationships between measured variables under each construct. Thereafter, confirmatory factor analysis (CFA) has been performed for testing and confirming relationships between the observed variables under each hypothesized construct [395, 149]. In addition, in order to investigate relationships among the hypothesized constructs, structural equation modeling is utilized. SEM is suitable to examine direct and indirect effects of independent variables on dependent variables. These direct and indirect effects are reflected as path coefficients, which are actually similar to standardized regression coefficients [182].
6.3.2.5 Hypothesis testing using Structural Equation Modeling

Structural equation modeling (SEM) is a collection of statistical models that seeks to explain relationships among multiple variables. It enables researchers to examine interrelationships among multiple dependent and independent variables simultaneously [149]. The reasons for selecting SEM for data analysis were, firstly; SEM has the ability to test causal relationships between constructs with multiple measurement items [149]. Secondly, it offers powerful and rigorous statistical procedures to deal with complex models [149, 327]. The relationships among constructs and indicator (measurement items) are validated by using confirmatory factor analysis (CFA), also known as the measurement model, and relationships between constructs) are tested using the structural model [149].

The variables used in structural models are divided into two types namely observed and latent variables [185]. Observed variables are those variables, which can be measured. On the other hand, latent variables cannot be directly measured: their values are estimated in the model from observed variables, called indicator variables. Both these observed and latent variables are further divided into endogenous and exogenous variables. Endogenous latent variables are predicted by some other latent variables in the model, and thus appear as dependent variables in some of the model equations. On the other hand, exogenous latent variables are those variables that are not predicted by other latent variables in the model. Therefore exogenous latent variables appear only as independent variables in the model equations.

In the present research, as discussed, a two-step approach is adopted to perform SEM analysis. In the first step, the measurement model was specified using the interrelationships between latent (enablers of organizational excellence) and indicator (parameters under each enabler) factors. For the measurement model, confirmatory factor analysis (CFA) was performed using the SEM software AMOS v.16.0. In the second step, the structural model related to dependent and independent variables were examined using the same software in order to test the hypotheses.

6.3.2.5.1 Measurement model specification and Confirmatory Factor Analysis results

In this research, Confirmatory Factor Analysis (CFA) has been performed on the measurement model to assess the unidimensionality, reliability, and validity of measures. Two broad approaches were used in CFA to assess the measurement model.
First, consideration of the goodness of fit (GOF) criteria indices and second is evaluation of validity and reliability of the measurement model.

**Confirmatory Factor Analysis**

CFA has been performed on the measurement model comprising nine factors, which are: self driven (SD); coordination (COD); innovation (INNO); effective communication (COMM); sustained change management (SCNG); supply chain optimization (SCO); process control (PC); Reliability & maintainability (R&M); and promptness (PROP) using AMOS v. 16, shown in Figure 6.2. These factors have been measured using 32 items, which were derived from the EFA. For instance, promptness is measured by 4 items code named as PROP1, PROP2, PROP3 and PROP4; coordination is measured using 6 items code named as COD1, COD2, COD3, COD4, COD5, and COD6. The three items (SCO2, SCO3 and PC3) that were eliminated during EFA were not considered for CFA.

![Figure 6.2: Initial model for confirmatory factor analysis](image-url)
Goodness of fit indices

Structural equation modeling (SEM) has three main types of fit measure indices: absolute fit indices, incremental fit indices, and parsimonious fit indices. The measurement model was evaluated by using the maximum likelihood (ML) estimation techniques provided by the AMOS v.16. The results revealed that the present structural model has a good fit based on the goodness of fit indices like CMIN/Df, GFI, AGFI, CFI, and RMSEA. Results of these fit measures obtained in this study and their recommended levels are presented in Table 6.7.

Table 6.7: Goodness of fit statistics for CFA

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Absolute fit measures</th>
<th>Incremental fit measures</th>
<th>Parsimony fit measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\chi^2$</td>
<td>Df</td>
<td>$\chi^2$/df</td>
</tr>
<tr>
<td>Obtained</td>
<td>1198.96</td>
<td>422</td>
<td>2.841</td>
</tr>
</tbody>
</table>

The results confirmed that model is fit to the data, indicating that no refinement in the model is required. Thus, the unidimensionality of the model/data was established [58, 149].

Reliability and Validity analysis

Reliability:

Reliability is concerned with the consistency, stability and reproducibility of measurement results [293]. It is the most important determinant of measurement instrument’s quality, such that, it helps to identify the inconsistencies and their effect on the measurement results. Reliability of the constructs has been checked through internal consistency by the application of Cronbach’s alpha [85] as well as by extracting the composite reliability with the help of variance extracted. Alpha values equal to or greater than 0.7 indicate high construct reliability [235]. The alpha value for the model is 0.746. Composite construct reliability is 0.908 during CFA. Thus the Cronbach’s alpha and composite construct reliability indicate that the scales are quite reliable (Table 6.8).
Validity:
Validity is the degree to which a measure accurately represents what it is supposed to [149]. According to Nunnaly [235], there are three types of validity that can be assessed: content validity, predictive validity, and construct validity. Content validity is the assessment of the correspondence between the individual items and the concept [149]. The current study addresses the content validity through the review of literature, and developing instrument with the help of experts. Construct validity is the extent to which a set of measured items actually reflects the theoretical latent construct those items are designed to measure. Thus it deals with the accuracy of measurement. Construct validity is made up four important components i.e. convergent validity, discriminant validity, nomological validity, and face validity.

Convergent validity is ‘the degree to which two or more attempts to measure the same concepts… are in agreement’ [21]. In CFA, the average variance extracted is a summary indicator of convergence. In our case AVE is 0.624 and is close to 0.5 for all items (Self driven- 0.412; coordination- 0.347; Reliability & maintainability- 0.375; Innovation- 0.563; effective communication- 0.436; Promptness- 0.402; Sustained change- 0.46; Process control- 0.65; and Supply chain - 0.424), which evidently establishes the convergent validity [122].

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Cronbach’s Alpha</th>
<th>Construct Reliability</th>
<th>Convergent Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtained</td>
<td>0.746</td>
<td>0.908</td>
<td>0.624</td>
</tr>
</tbody>
</table>

6.3.2.5.2 Structural model evaluation and hypotheses testing
This section presents results of hypotheses testing. Table 6.1 and Figure 6.1 shows the 19 hypotheses (H1a, H1b, H1c, H1d, H2a, H2b, H2c, H3a, H3b, H3c, H4a, H4b, H4c, H5a, H5b, H6a, H7a, H7b and H8a) that were used to test the relationships between the latent constructs. The latent constructs used in the proposed theoretical model were classified in two main categories: exogenous and endogenous constructs. self driven (SD) is an exogenous construct while the endogenous constructs are coordination (COD); innovation (INNO); effective communication (COMM); sustained change management (SCNG); supply chain optimization (SCO); process
control (PC); reliability & maintainability (R&M); and promptness (PROP). AMOS V. 16 has been applied to test the hypothesized relationships.

The structural model assessment is done based on significant coefficient parameter estimates. The parameter estimates were used to produce the estimated population covariance matrix for the structural model. The model was defined by 32 measurement items for nine latent constructs. The covariance matrix among the constructs was applied to test the model. When the critical ratio (CR or t value) is higher than 1.645 and 2.575 for an estimate (regression weight), then the parameter coefficient value is statistically significant at the .01 and 0.001 levels respectively [149]. Critical ratio or t-value was obtained by dividing the regression weight estimate by the estimate of its standard error (S.E). Using the path estimates and CR values, 19 causal paths were examined in this research study. For 9 causal paths estimates t-values were above the 2.575 critical values at the significant level \( p \leq 0.001 \) and for 1 causal path1 t-values was above the 1.645 at the significant level \( p \leq 0.01 \). The t-values for remaining 9 constructs were found statically not significant. The overall parameter estimates are presented in the Table 6.9.

Results presented in Table 6.9 indicate that 10 out of 19 hypothesized paths between independent and dependent variables are significant. For instance, the hypothesized path between self driven and coordination with CR value of 3.449 (>2.575) was statistically significant \( (p \leq 0.001) \). Similarly, paths between self driven and sustained change management, self driven and process control, self driven and reliability & maintainability, coordination and innovation, coordination and communication, innovation and reliability & maintainability, communication and supply chain optimization, communication and promptness, and reliability & maintainability and promptness are statistically significant at \( p \leq 0.001 \). Furthermore relationship between self driven and sustained change management is statistically significant at \( p \leq 0.01 \). Whereas the hypothesized paths between coordination and sustained change; innovation and communication, innovation and sustained change, effective communication and sustained change; sustained change and process control; sustained change and promptness; supply chain optimization and promptness; process control and reliability & maintainability; process control and supply chain optimization indicated that their t-values did not exceed the cut-off point required for statistical significance. Thus, these paths were not statistically significant and shall be eliminated.
Therefore, overall assessment of parameter estimate results suggested that 10 out of 19 hypothesized paths were significant, that suggests that the observed data are inconsistent with the assumption that the null hypothesis is true, and thus that hypothesis must be rejected and the alternative hypothesis is accepted as true. Thus the results indicated support for the 10 path relationships and all others are rejected.

6.3.2.6 Modifying structural model by removing non-significant paths

As discussed in the previous section, testing of hypotheses resulted in 10 hypothesized paths i.e. H1a, H1b, H1c, H1d, H2a, H2b, H3b, H4b, H4c and H8a to be positive and statistically significant. While, 9 hypothesized paths i.e. H2c, H3a, H3c, H4a, H5a, H5b, H6a, H7a and H7b were found statistically not significant and hence, were rejected. Consequently, the structural model was re-specified by removing these
insignificant paths and run on AMOS again. However, the fit indices obtained thereafter (shown in Table 6.10) indicates that the resultant structural model provides bad fit to the data. The value of $\chi^2/df = 3.073$ is out of acceptable range; also other fit measures showed that model did not adequately fit the observed data.

Table 6.10: Goodness of fit statistics for the modified model

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Absolute fit measures</th>
<th>Incremental fit measure</th>
<th>Parsimony fit measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\chi^2$</td>
<td>Df</td>
<td>$\chi^2/df$</td>
</tr>
<tr>
<td>Obtained from initial model</td>
<td>1355.2</td>
<td>422</td>
<td>3.07</td>
</tr>
<tr>
<td>Obtained after refinement</td>
<td>1277.2</td>
<td>449</td>
<td>2.85</td>
</tr>
</tbody>
</table>

Note: $\chi^2$ = Chi-square; df = degree of freedom; GFI = Goodness of fit index; RMSEA = Root mean square error of approximation; CFI = Comparative fit index; AGFI = Adjusted goodness of fit index.

Therefore, in order to improve the model fit, refinement is done by incorporating the suggested modification indices. If no modification indices are displayed, this means that none exceeded the specified threshold. After incorporating these modifications the model fit was re-examined. Chi square/ df value was then observed to be within the threshold level $\chi^2/df = 2.845$. Although the likelihood ratio chi-square ($p = 0.000$) was significant; however, other fit measures showed that the model was adequately fit to the observed data. The absolute fit measures i.e. GFI and RMSEA were 0.827 and 0.071 respectively indicating good fit of model. The incremental fit measure i.e. CFI was 0.629, which is not very far the minimum requirement showing adequate fit and the parsimony fit measure i.e. AGFI was 0.797, which also is close to the cut-off point.
A final run of revised model using AMOS v.16.0 indicated that 9 paths were statistically significant. The results suggest that standardized estimates and critical ratio values for these hypotheses are statistically significant and thus support these hypotheses. Revised structural model is shown in Figure 6.3 and results are presented in Table 6.11. Chi-square difference test is also applied to compare the overall fit of both the models. The result show that the new model is better and hence was accepted.

Table 6.11: Parameter estimates for the revised model

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Hypothesis</th>
<th>Hypothesized Paths</th>
<th>Path Coefficients (standardized weights)</th>
<th>Unstandardized estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H1a</td>
<td>SD --&gt; COD</td>
<td>0.749</td>
<td>0.304</td>
<td>0.086</td>
<td>3.552</td>
<td>***</td>
</tr>
<tr>
<td>2</td>
<td>H2b</td>
<td>COD --&gt; COMM</td>
<td>0.86</td>
<td>1.929</td>
<td>0.52</td>
<td>3.709</td>
<td>***</td>
</tr>
<tr>
<td>3</td>
<td>H4b</td>
<td>COMM --&gt; SCO</td>
<td>0.688</td>
<td>1.279</td>
<td>0.216</td>
<td>5.914</td>
<td>***</td>
</tr>
<tr>
<td>4</td>
<td>Suggested</td>
<td>SD --&gt; INNO</td>
<td>0.463</td>
<td>0.274</td>
<td>0.066</td>
<td>4.126</td>
<td>***</td>
</tr>
<tr>
<td>5</td>
<td>Suggested</td>
<td>SCO --&gt; SYSA</td>
<td>0.65</td>
<td>0.244</td>
<td>0.042</td>
<td>5.738</td>
<td>***</td>
</tr>
<tr>
<td>6</td>
<td>H3b</td>
<td>INNO --&gt; SYA</td>
<td>0.35</td>
<td>0.376</td>
<td>0.098</td>
<td>3.821</td>
<td>***</td>
</tr>
<tr>
<td>7</td>
<td>H1c</td>
<td>SD --&gt; PC</td>
<td>0.905</td>
<td>1.114</td>
<td>0.18</td>
<td>6.174</td>
<td>***</td>
</tr>
<tr>
<td>8</td>
<td>H8</td>
<td>SYA --&gt; PROP</td>
<td>0.679</td>
<td>0.726</td>
<td>0.135</td>
<td>5.377</td>
<td>***</td>
</tr>
<tr>
<td>9</td>
<td>Suggested</td>
<td>PC --&gt; SCNG</td>
<td>0.541</td>
<td>0.439</td>
<td>0.098</td>
<td>4.475</td>
<td>***</td>
</tr>
</tbody>
</table>

Note: *** Significant at 0.001 level (two tailed)
In summary, the results suggested that after removing insignificant paths and incorporating modifications, a best parsimonious model was achieved. Besides, the revised model adequately fits the observed data.

6.3.3 Findings and discussions from structural equation modeling

The results of hypothesis testing indicated that out of 19 paths only 10 were significant. However in the revised model only 6 paths out of those 10 significant paths were retained because of poor model fit. Furthermore, 3 new suggested paths were incorporated to make the final model.
The final model reveals that self driven is an independent enabler that drives others in achieving organizational excellence (Figure 6.4). Self driven employees or a self regulated system helps in keeping various organizational processes under control ($\beta=0.905$). In fact such well controlled processes further make it easy for organizations to survive in dynamically changing conditions ($\beta=0.541$). This is because if the internal processes themselves will keep fluctuating, they would not allow the system to sustain the changes. Also self driven is a prerequisite in driving coordination ($\beta=0.745$), but has a lesser influence in driving innovation ($\beta=0.463$).

The resulting model also reveals that coordination facilitates better management of supply chain by making the communication more effective ($\beta=0.86$), which in turn helps in achieving an optimized supply chain ($\beta=0.65$). Furthermore, a well managed supply chain ($\beta=0.65$) and innovation ($\beta=0.35$) results in improving overall availability of the system which further makes the system prompt towards internal and external stimuli ($\beta=0.679$).

To conclude the enablers that drive others to achieve organizational excellence are named as *strategic variables* or enablers. Whereas those enablers, achievement of whom are evidently reflect on organizational excellence are named *performance outcomes* or results. Self driven, coordination, effective communication, innovation, process control, supply chain optimization, and reliability & maintainability are strategic variables; while sustained change management and promptness, are
performance outcomes. These strategic variables enable human body to achieve performance outcomes to reach excellence. Thus the human body inspired model of excellence has 7 enablers and 2 result outcomes.

6.4 Determining relative importance of organizational enablers using AHP

6.4.1 Methodology

This section of the paper is aimed to validate the model developed. The outcome of SEM is an empirically validated model with calculated influence of its enablers on each other. It however does not quantify the relative importance of each enabler in achieving organizational excellence. Therefore, Analytic Hierarchy Process (AHP) has been applied to quantify or weigh the importance of enablers in achieving organizational excellence. Relative weight of each enabler would help managers in setting the priorities and will also suggest key focus areas. Following are the basic steps in accomplishing AHP:

Step I: Structuring hierarchy of organizational excellence: First level of hierarchy contains the macro goal, which, in this case is achievement of organizational excellence. The next level contains 9 enablers derived from human body organization, and which contribute to the goal at macro level. The last level contains three main industrial sectors, i.e. primary, secondary and tertiary. (Figure 6.5) All enablers will be analyzed separately corresponding to each sector.

Figure 6.5: AHP Model

Step II: Data collection and analysis: After structuring the AHP hierarchy, a questionnaire consisting of all the elements of the three levels of the AHP model is designed and is used to collect the pair-wise comparison judgments from evaluation experts (Appendix 4). The pair-wise comparison judgments are made with respect to
enablers of one level of hierarchy given the enabler of the next higher level of hierarchy, starting from the level of organizational excellence down to the level of enablers. This questionnaire was mailed to the same experts who were approached for TISM for determining the relative importance of each individual variable w.r.t. the goal. The nine-point scale as suggested by Saaty [275] has been used to assign pair-wise comparisons of all elements in each level of the hierarchy. Moreover, the results from the pair-wise comparisons may be somewhat subjective and inconsistent; therefore, an index called the consistency ratio (CR) is used to check the validity of relative measures. According to a rule of thumb suggested by Saaty [275], a CR value equal to 0.10 or less is considered acceptable. The results collected from the questionnaire are used to form the corresponding pair-wise comparison judgment matrices (PCJMs) for determining the normalized weights as explained in the section below. The pair-wise matrices are attached in Appendix 5.

**Step III: Determining Normalized Weights:** Each of the pair-wise comparison judgment matrices obtained in the previous step is then translated into the corresponding largest eigen value problem and is solved to find the normalized and unique priority weights for each criterion as shown in Table 6.12. The software system called Super Decisions is used to determine the normalized priority weights. The Consistency Ratio (CR) of each PCJM is shown along the normalized weight table. It can be seen that the consistency ratio of each of the PCJM is equal to or below the rule-of-thumb value of CR equal to 0.1. This clearly implies that the evaluators are consistent in assigning pair-wise comparison judgments [275].

<table>
<thead>
<tr>
<th>Enablers</th>
<th>Primary</th>
<th>Secondary</th>
<th>Tertiary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normalized</td>
<td>Idealized</td>
<td>Normalized</td>
</tr>
<tr>
<td>Coordination</td>
<td>0.09</td>
<td>0.26</td>
<td>0.02</td>
</tr>
<tr>
<td>Effective communication</td>
<td>0.08</td>
<td>0.23</td>
<td>0.06</td>
</tr>
<tr>
<td>Innovation</td>
<td>0.15</td>
<td>0.41</td>
<td>0.10</td>
</tr>
<tr>
<td>Process control</td>
<td>0.05</td>
<td>0.15</td>
<td>0.21</td>
</tr>
<tr>
<td>Promptness</td>
<td>0.03</td>
<td>0.09</td>
<td>0.04</td>
</tr>
</tbody>
</table>
Step IV: Synthesis: After computing the normalized priority weights for each PCJM of the AHP hierarchy, the next phase is to synthesize the solution for finding the significance of each variable towards the macro goal. The normalized local priority weights of all enablers are combined together with respect to each sector to obtain the global composite priority weights of all enablers used in the third level of the AHP model.

Table 6.13: Overall synthesis priorities for the enablers

<table>
<thead>
<tr>
<th>Enablers</th>
<th>Ideals</th>
<th>Normalized</th>
<th>Raw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination</td>
<td>0.50</td>
<td>0.11</td>
<td>0.06</td>
</tr>
<tr>
<td>Effective communication</td>
<td>0.40</td>
<td>0.09</td>
<td>0.04</td>
</tr>
<tr>
<td>Innovation</td>
<td>0.42</td>
<td>0.09</td>
<td>0.05</td>
</tr>
<tr>
<td>Process control</td>
<td>0.43</td>
<td>0.10</td>
<td>0.05</td>
</tr>
<tr>
<td>Promptness</td>
<td>0.31</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>Self driven</td>
<td>1.00</td>
<td>0.22</td>
<td>0.11</td>
</tr>
<tr>
<td>Supply chain optimization</td>
<td>0.68</td>
<td>0.15</td>
<td>0.07</td>
</tr>
<tr>
<td>Sustained change management</td>
<td>0.41</td>
<td>0.09</td>
<td>0.05</td>
</tr>
<tr>
<td>Reliability &amp; maintainability</td>
<td>0.36</td>
<td>0.08</td>
<td>0.04</td>
</tr>
</tbody>
</table>
6.4.2 Interpretations of AHP

After calculating the global weights of each enabler, it can be observed in Table 6.13 that self driven occupies the top-most rankings in the list having global weight of 0.22, while supply chain optimization (0.15) occupy the second rank. Promptness and Reliability & maintainability occupies the bottom ranking having global weight of 0.07 and 0.08 respectively.

![Figure 6.6: Proposed model for evaluating organizational excellence](image)

6.5 Application of the proposed model for evaluating organizational excellence

This model is proposed (Figure 6.6) for evaluating the level of organizational excellence achieved by various organizations. For that they are required to evaluate themselves on the parameters in the model. It will involve the following steps:

1. Self evaluation of the organization by rating themselves on certain parameters under each enabler. Format for evaluation is attached in Appendix 6.
2. Total score will be calculated for each enabler using the following formula:

\[
Score\ on\ excellence\ achieved = \sum_{i=1}^{n} W_i \sum_{j=1}^{m} \left(\frac{r_{ij}}{5} \times w_j\right)
\]

\(n=\) number of enablers, \(i = 1-9\)
\(W_i =\) relative weight of each enabler (derived with AHP)
\(m =\) number of parameters or sub-variable under each enabler, \(j= 1, 2, 3….m\)
\( r_{ij} = \) response on a scale of 1 to 5 for \( i_j^{th} \) sub-variable

\( w_j = \) weight allocated to the \( j^{th} \) parameter under the respective enabler

3. Interpretation of the score can be done as per the guidelines given in Table 6.14, to decide the future directions.

<table>
<thead>
<tr>
<th>Total score</th>
<th>Interpretation of total score</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 750</td>
<td>The organization is on the road to OE and serves as a model for others in the business.</td>
</tr>
<tr>
<td>&lt;750; &gt;=600</td>
<td>The organization is showing sincere efforts in implementing improvement initiatives and is ready to achieve greater heights in OE.</td>
</tr>
<tr>
<td>&lt;600; &gt;400</td>
<td>The organization has started its OE journey and they need a more systematic approach to improve in all parts of the OE parameters.</td>
</tr>
<tr>
<td>&lt;400</td>
<td>The strategic implementation of the organization is poor. There is a need to re-evaluate the direction and capabilities of the organization and potentially seek OE assistance so that the organization can move to the next level.</td>
</tr>
</tbody>
</table>

6.6 Model verification

Model verifications have been done by measuring degree of excellence of two well known companies (Company A and B) by taking opinion of their senior level managers about the organization on various parameters of the proposed model. The total points are calculated based on self assessment done by the managers and it shows that company A has scored 780 points, and company B has scored 670 points out of 1000 as shown in Table 6.15. Table 6.15 also shows specific points scored under various parameters of the model by both companies. Opinion of the same respondents about the organization was also taken on EFQM model of business excellence. According to the results obtained from EFQM model, company A has scored 818 points while B has scored 721 points out of 1000 as shown in Table 6.16. The results obtained from both the models show that both companies have reached organizational excellence. In fact, the results were found comparable and were also in line with the overall perception of public about these organizations. The results demonstrate the efficacy of the model in determining the degree of excellence achieved.
Table 6.15: Evaluation of level of organizational excellence achieved by company A and B using human body inspired model of organizational excellence

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameters</th>
<th>COMPANY A</th>
<th>COMPANY B</th>
<th>COMPANY B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Relative weight of parameter for service industry</td>
<td>Total points scored on self assessment</td>
<td>Relative weight of parameter for manufacturing industry</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Promptness</td>
<td>70</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Co-ordination</td>
<td>110</td>
<td>90</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>Effective communication</td>
<td>90</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>Supply chain optimization</td>
<td>150</td>
<td>120</td>
<td>110</td>
</tr>
<tr>
<td>5</td>
<td>Innovation</td>
<td>90</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>Sustained change management</td>
<td>90</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>7</td>
<td>Self driven</td>
<td>220</td>
<td>180</td>
<td>130</td>
</tr>
<tr>
<td>8</td>
<td>Process control</td>
<td>100</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>9</td>
<td>System availability</td>
<td>80</td>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td><strong>Total score on organizational excellence achieved</strong></td>
<td><strong>1000</strong></td>
<td><strong>780</strong></td>
<td><strong>670</strong></td>
</tr>
</tbody>
</table>

Table 6.16: Evaluation of level of organizational excellence achieved by company A and B using EFQM model of organizational excellence

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameters</th>
<th>COMPANY A</th>
<th>COMPANY B</th>
<th>COMPANY B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Relative weight of parameter for service industry</td>
<td>Total points scored on self assessment</td>
<td>Total points scored on self assessment</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Leadership</td>
<td>100</td>
<td>80</td>
<td>65</td>
</tr>
<tr>
<td>2</td>
<td>People</td>
<td>90</td>
<td>77</td>
<td>69</td>
</tr>
<tr>
<td>3</td>
<td>Strategy</td>
<td>80</td>
<td>70</td>
<td>64</td>
</tr>
<tr>
<td>4</td>
<td>Partnership &amp; resources</td>
<td>90</td>
<td>72</td>
<td>77</td>
</tr>
<tr>
<td>5</td>
<td>Processes, products &amp; services</td>
<td>140</td>
<td>136</td>
<td>112</td>
</tr>
<tr>
<td>6</td>
<td>People results</td>
<td>90</td>
<td>69</td>
<td>67.5</td>
</tr>
<tr>
<td>7</td>
<td>Customer results</td>
<td>200</td>
<td>173</td>
<td>142</td>
</tr>
<tr>
<td>8</td>
<td>Society results</td>
<td>60</td>
<td>36</td>
<td>27</td>
</tr>
<tr>
<td>9</td>
<td>Business/ Key results</td>
<td>150</td>
<td>105</td>
<td>97.5</td>
</tr>
<tr>
<td></td>
<td><strong>Total score on organizational excellence achieved</strong></td>
<td><strong>818</strong></td>
<td><strong>721</strong></td>
<td></td>
</tr>
</tbody>
</table>
6.7 Conclusions

This chapter is intended to validate the enablers of human body inspired model of organizational excellence proposed in the previous chapter by conducting a survey using SEM. Besides, AHP has also been applied to find relative importance of each enabler. The proposed model has also been applied to two companies to test its usefulness in evaluating the degree of organizational excellence achieved. The results were also compared with the score obtained using EFQM model of business excellence to further validate the proposed model. It is expected that the final model developed can be used by businesses for self assessment of evaluating the level of excellence achieved. Moreover, it is hoped that some ways for redesigning the organizations can be developed based on this model, which in turn may help organizations in achieving its set goals and objectives which in turn will pave way for their growth and expansion.