Chapter 6

FMCDM-GA Approach for Measuring IT Service Quality in the Context of Team-Level Service Climate

6.1 INTRODUCTION

The offshore/on-site teams’ service quality is one of the most significant aspects of improving the productivity and quality of global software development (GSD) projects. The main aim of this study is to determine the service quality dimension that imperatively includes (i) service behaviors (ii) service providers and (iii) service product to evaluate the GSD team-level service quality in GSD projects. In this study, the aim is to address one such determinant of IT service quality in the software service outsourcing context – service behaviors (service climate).

The operational procedure of this chapter is as follows: (i) the weights of GSD teams’ service climate attributes with respect to IT service quality criteria are described in linguistic scales with triangular fuzzy numbers; (ii) FMCDM approach is used to determine the degree of importance with respective service quality criteria and is combined into genetic-algorithm (GA) based learning approach; (iii) twenty-five comprehensive service quality criteria and service climate measurement framework for GSD projects via systematic literature review are taken into account and to extend the earlier work; (iv) this empirical study is tested with 100 offshore/on-site experts in India to analyze IT service quality criteria in the context of GSD team-level service climate and GSD project outcome relationship. The managerial implications and summary is presented.

6.2 BACKGROUND AND MOTIVATION

In today’s world, Indian software companies have expanded their business operations across national and geographical boundaries. GSD teams’ service quality has created a significant impact on the development and servicing of the software in a distributed environment. According to the literature reviews (Gorla et al. 2010; Kettinger et al. 2005; Jiang et al. 2002; Parasuraman et al. 1985; Gorla et al. 2010;
DeLone et al. 2003; Pitt 1995), IT service quality in the context of software
development outsourcing has been explicitly addressed from client and vendor
perspective. In addition, past researches (e.g. Babakus et al., 1992; Cronin et al.,
1992) have addressed the factors that have significant impact on service employees’
behavior with regard to deliver the service quality. Based on this context, this study
explored the IT service quality criteria on this basis to evaluate the service climate of
GSD teams’ in the software service outsourcing context.

![Hierarchical Decision Network](image)

**Figure 6.1:** The Hierarchical Decision Network: Evaluating IT Service Quality in the Context of Offshore/On-site Teams’ Service Climate and GSD project outcome relationship

The objective of this study using FMCDM approach combined with a genetic-
algorithm (GA) based learning approach as suggested by (Yi-Chung Hu et al., 2011;
Yi-Chung Hu., 2009) is adopted to determine the degree of importance of IT service
quality criteria with respect to service climate attributes of GSD teams. The purpose
of using GA-based learning approach is to automatically find the connection weights
of a given hierarchical structure (see Fig 6.1) by minimizing the root-mean-square error between the actual and desired outputs of each pattern (e.g. Yi-Chung Hu et al., 2011; Yi-Chung Hu., 2009). The FMCDM approach having a hierarchical structure consists of three decision levels: objective, aspects, and attributes.

As depicted in Fig 6.1, the hierarchical structure is employed to reveal the IT service quality through the lens of GSD team-level service climate and GSD project outcome relationship. This chapter reveals that the IT service quality criteria was categorized into six major aspects and twenty-five service climate attributes are as summarized in Table 6.1 and Table 6.2. Furthermore, these twenty-five service climate attributes are classified under three IT service climate dimensions (see Fig 6.1 and Table 6.5) to determine the relationship of GSD teams’ service climate and GSD project outcome in the context of IT service quality.

6.3 RESEARCH APPROACH

This section (6.3.1) discusses the methodology to compute an IT service quality criterion on the basis of FMCDM-GA as presented. The problem design, GA learning approach, and algorithm implementation are given in section 6.3.2, 6.3.3, and 6.3.4. In section 6.4 elaborates the determinants for evaluating the GSD teams’ service quality. The presentation of the study in data analysis is shown in section 6.5. Finally the result and discussion of the study is drawn in section 6.6.

6.3.1 COMPUTING IT SERVICE QUALITY CRITERIA BY FMCDM

1. Construct a decision matrix $\tilde{A}$ for the degree of important of IT service quality aspect with respect to IT service climate attributes $(D_j, j = 1, 2, 3, ..., n)$. The respondents $(R^i, i = 1, 2, 3, ..., m)$ were asked to provide their subjective judgments about the importance weights of each aspects and attribute it by using linguistic scales (refer table 5.1). The decision matrix $\tilde{A}$ is as follows

$$
\begin{bmatrix}
R^1 \\
\vdots \\
R^m \\
\end{bmatrix}
\begin{bmatrix}
D_1 \\
\vdots \\
D_n \\
\end{bmatrix}
\begin{bmatrix}
\tilde{a}_{11}^1 & \tilde{a}_{12}^1 & \tilde{a}_{13}^1 & \ldots & \tilde{a}_{1n}^1 \\
\tilde{a}_{21}^1 & \tilde{a}_{22}^1 & \tilde{a}_{23}^1 & \ldots & \tilde{a}_{2n}^1 \\
\tilde{a}_{31}^1 & \tilde{a}_{32}^1 & \tilde{a}_{33}^1 & \ldots & \tilde{a}_{3n}^1 \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
\tilde{a}_{n1}^1 & \tilde{a}_{n2}^1 & \tilde{a}_{n3}^1 & \ldots & \tilde{a}_{nn}^1 \\
\end{bmatrix}
$$

$$
\begin{bmatrix}
R^1 \\
\vdots \\
R^m \\
\end{bmatrix}
\begin{bmatrix}
D_1 \\
\vdots \\
D_n \\
\end{bmatrix}
\begin{bmatrix}
\tilde{a}_{11}^2 & \tilde{a}_{12}^2 & \tilde{a}_{13}^2 & \ldots & \tilde{a}_{1n}^2 \\
\tilde{a}_{21}^2 & \tilde{a}_{22}^2 & \tilde{a}_{23}^2 & \ldots & \tilde{a}_{2n}^2 \\
\tilde{a}_{31}^2 & \tilde{a}_{32}^2 & \tilde{a}_{33}^2 & \ldots & \tilde{a}_{3n}^2 \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
\tilde{a}_{n1}^2 & \tilde{a}_{n2}^2 & \tilde{a}_{n3}^2 & \ldots & \tilde{a}_{nn}^2 \\
\end{bmatrix}
$$

$$
\begin{bmatrix}
R^1 \\
\vdots \\
R^m \\
\end{bmatrix}
\begin{bmatrix}
D_1 \\
\vdots \\
D_n \\
\end{bmatrix}
\begin{bmatrix}
\tilde{a}_{11}^3 & \tilde{a}_{12}^3 & \tilde{a}_{13}^3 & \ldots & \tilde{a}_{1n}^3 \\
\tilde{a}_{21}^3 & \tilde{a}_{22}^3 & \tilde{a}_{23}^3 & \ldots & \tilde{a}_{2n}^3 \\
\tilde{a}_{31}^3 & \tilde{a}_{32}^3 & \tilde{a}_{33}^3 & \ldots & \tilde{a}_{3n}^3 \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
\tilde{a}_{n1}^3 & \tilde{a}_{n2}^3 & \tilde{a}_{n3}^3 & \ldots & \tilde{a}_{nn}^3 \\
\end{bmatrix}
$$

(1)
In this decision matrix, \( m \) denotes the number of evaluations and \( n \) is the number of evaluation factors. Let \( (L_{ij}, M_{ij}, U_{ij}) \) denote \( \bar{a}_{ij} \) where \( 0 \leq L_{ij} \leq M_{ij} \leq U_{ij} \leq 100 \) represents the fuzzy performance value assessed by \( i^{th} \) respondents for \( j^{th} \) evaluation factor.

2. The subjective judgments of each respondent differ from others and this is based on their experience and knowledge, this study employs linguistic scale values with corresponding triangular fuzzy number to incorporate the fuzzy performance values of \( m \) respondents to match the perceptions of individuals. In Fig 6.1, \( C_j (1 \leq j \leq s) \) s is the aspect node and \( o \) denotes fuzzy performance values of \( j^{th} \) aspect and objective respectively.

\[
C_j = \left( \sum_{i=1}^{n} W_{ij}^{(a)} L_{ij}, \sum_{i=1}^{n} W_{ij}^{(a)} M_{ij}, \sum_{i=1}^{n} W_{ij}^{(a)} U_{ij} \right)
\]

Here \( (L_{ij}, M_{ij}, U_{ij}) \) denotes the normalized fuzzy number, \( W_{ij}^{(a)} \) is degree of importance of \( a_{ij} \) with respect to the \( j^{th} \) evaluation factor which is denoted by \( (1 \leq j \leq s) \) and

\[
\sum_{i=0}^{n} W_{ij}^{(a)} = 1
\]

Here \( W_{ij}^{(a)} \) is the local weight of \( a_{ij} \) under \( c_j \). Let \( c_j = (L_{cj}, M_{cj}, U_{cj}) \) denote the synthesized fuzzy performance value (i.e., \( o \)) can be obtained via \( c_j \) as follows:

\[
o = \sum_{j=1}^{s} W_j^{(o)} c_j
\]

\[
= \left( \sum_{i=1}^{n} W_{ij}^{(o)} L_{cj}, \sum_{i=1}^{n} W_{ij}^{(o)} M_{cj}, \sum_{i=1}^{n} W_{ij}^{(o)} U_{cj} \right)
\]

Here \( W_j^{(o)} \) denoted the weights of aspects \( c_j \) with respect to objective, and

\[
\sum_{i=1}^{n} W_{ij}^{(o)} = 1
\]

The global weight of \( a_{ij} \) denoted by \( W_t^{(o)} \) for the objective is calculated as
Then, the sum of the global weights of all service climate attributes is equal to 1

$$
\sum_{i=1}^{n} W_i^g = 1
$$

3. Now we will compute the system performance, where \( o \) will be converted to non-fuzzy value using defuzzification to convert a fuzzy number to crisp value. Defuzzification is a method to locate best non fuzzy performance value. Where \((O_l, O_m, O_u)\) denote values for objective. Center of area method as suggested by Kuncheva (2000) is used for converting objective ‘O’ to corresponding BNP value, \( BNP_o \):

$$
BNP_o = \frac{(o_u - o_l) + (o_m - o_l)}{3} + o_l
$$

The hierarchical structure as shown in Fig 6.1 is similar to the feed-forward neural network which is commonly used for input-output mapping problem. The feed-forward neural network consists of three layers that is input, hidden and output layers. In this study, the layer consisting aspects of IT service quality criteria with respect to service climate is represented via the hidden layer. Here \( W_{ij}^{(a)} \) is the connection weight in the link between the \( i^{th} \) input (i.e., \( c_j \)) and \( j^{th} \) hidden (i.e., \( a_j \)) neurons, \( W_j^{(o)} \) is the connection weights in the link between the \( j^{th} \) hidden and the output neurons.

6.3.2 PROBLEM DESIGN

Let P indicate a set of parameters including values \( W_{ij}^{(a)} \) and \( W_j^{(o)} \) for the given hierarchical decision network. The problem of determining \( W_{ij}^{(a)} \) and \( W_j^{(o)} \) can be formulated by single-objective optimization problem (e.g. Hu 2008):

1. To minimize the root mean square error can be defined as

$$
\text{Minimize } e(p)
$$
Here $e(P)$ is the root-mean-square error obtained by $P$. Assume that $o_i$ is the fuzzy number (actual output) with respect to an $n$-dimensional non-fuzzy input vector $(g_{i1}, g_{i2}, g_{i3}, \ldots, g_{in})$ for the given network. Without loss of generality $e(P)$ can be defined as

$$e(P) = \sqrt{\frac{\sum_{i=1}^{m} (BNP_{d_i} - BNP_{o_i})^2}{m}} \quad (10)$$

where $BNP_{d_i}$ and $BNP_{o_i}$ denote the defuzzified values of $d_i$ and $o_i$.

2. The single-objective genetic algorithm which is the general purpose optimization technique as shown in Eqn. (12) and Eqn. (13). To calculating the fitness function (e.g. Yi-Chung Hu (2009) as shown in Eqn. (11)

$$F(P) = \frac{1}{1 + e(P)} \quad (11)$$

**Objective Function**

$$G(W_1, W_2, \cdots, W_n) = \max_{(i \neq j)} (C_{i1}, C_{i2}, \cdots, C_n) \quad (12)$$

\[
\left\{ \begin{array}{l}
\text{maximize } G(W_1, W_2, \cdots, W_n) \\
\text{Subject to } \sum_{i=1}^{n} W_i = 1 \\
\text{Where } G(W_1, W_2, \cdots, W_n) \text{ is defined in Eqn. (12)}
\end{array} \right. \quad (13)
\]

The fitness value of the set of connection weights is updated at each generation for the genetic algorithm. $G(w_1, w_2, \ldots, w_n)$ as given in (12) and (13) is obviously nonlinear function in decision variables. Our objective is to find values of weights of set of parameters which will be maximizing their membership in corresponding fuzzy sets.

6.3.3 GENETIC OPERATIONS

Let $Np$ and $Ns$ represent the over-all population and the total number of generations, respectively. Each factor is coded as a binary string. Binary numbers 1 and 0 are assigned on the basis of the population and min-max normalization. The fitness values of each chromosome in the over-all population are obtained and then
selection, crossover and mutation genetic operations are performed as suggested by [3,19,20]. Through these series of genetic operation we can obtain the new $N_p$ strings in the next population, where $N_p$ has been taken as 100.

For generating new strings for next generation, roulette wheel selection approach has been used. First, randomly select two strings from the population are selected. Then, two point cross over is performed on two selected chromosomes. The process is repeated till we reach the stopping condition $N_s$. Here, stopping conditions $N_s$ have been taken as 500. The stopping condition is assigned for sufficient evolution of the genetic algorithm. With these series of crossover and mutation operations new children are got. The crossover and mutation are performed once a probability is assigned. $P_{mut}$ is the probability of mutation which is taken as 0.01. The lower value of mutation probability has been taken into account as lower value does not allow the generation of excessive deviation. $P_{cross}$ is the crossover probability which is taken as 0.90. The larger value of crossover probability allows the exploration of more solution space. When crossover is performed two new children are got. Then, finally when stopping condition is reached mutation is performed. With mutation one bit in the given string of newly generated chromosomes is inverted.

6.3.4 GENETIC ALGORITHM IMPLEMENTATION

Algorithm: A hierarchical network for decision problem.

a. Population size: $N_p$
b. Total Generations: $N_s$
c. Crossover Rate: $P_{cross}$
d. Mutation Rate: $P_{mut}$
e. No. of elite chromosomes: $N_e$

Output: Degree of importance of all attributes.

Step1: Initialization: Generate $N_p$ binary strings for initial generation.

Step2: Calculate fitness values: Calculate the fitness value for each string in the current population.
Step 3: Termination test: The overall number of generations is performed as the stopping condition. If stopping condition is not satisfactory then continue with Step 4. That is, the genetic operations are repeated again to generate new strings in the next population.

Step 4: Select two chromosomes which have highest fitness value.

Step 5: Perform crossover: Generate random value of x. If x<Pcross perform crossover and evaluate the fitness value of the new offspring. If the fitness value is not obtained for better chromosomes go to Step 7.

Step 6: Perform mutation: If x<Pcross is true. Generate random number y. If y<Pmut is true then perform mutation. If the values obtained from mutation process are not for better chromosomes go to Step 7. That is add value y to first gene of the offspring and normalize them otherwise iterate.

Step 7: Otherwise two worst chromosomes are replaced by best chromosomes.

Step 8: Iterate the above algorithm till stopping condition Ns.

6.4 EMPIRICAL STUDY

The earlier studies discussed in Chapter 3 and Chapter 5 emphasized that service provider companies should focus GSD teams’ partnership quality factors to have significant impact on GSD project outcome. In addition, to extend the earlier work this study covers twenty-five attributes to evaluate the IT teams (offshore/on-site) service quality through lens of service climate measurement framework for the outcome of GSD projects. To evaluate the GSD team-level service climate with respect to IT service quality criteria, this study identifies the people (offshore/on-site project experts) who are involved in GSD projects and formed the committee which comprises three groups: Executive committee (comprising project board, project manager), solution development teams (comprising user team leader, application team leader, technical team leader) and solution delivery teams (comprising process specialist, solution architect, technical writer). In this empirical study, we utilize survey research methods based on the data collected from 338 software professionals to assess GSD team-level service climate. Thus, this study tested with 100 offshore/on-site experts belonging to the above mentioned groups in India to reveal the relationship between IT service quality criteria in the context of offshore/on-site teams’ service climate and GSD project outcome.
6.4.1 THE DETERMINANTS FOR EVALUATING IT TEAMS SERVICE QUALITY

In the service climate literature, the number of studies has investigated various types’ of strategic climates: climate for knowledge sharing (Kankanhalli et al., 2005), ethical climate of IT professionals (Iacovou et al., 2009), and communication climate in outsourced projects (Rai et al., 2009) in the context of IT service. Moreover, earlier studies (Jia Ronnie et al., 2008; Susskind et al., 2003) have demonstrated that co-worker support is important in the IT context. Thus, co-worker support is absolutely necessary to build a favorable IT service climate. In the present study, co-worker support refers to work-related assistance between GSD teams’ within the IT units.

Subsequently, the earlier work discussed in Chapter 3 and Chapter 5 has investigated GSD teams’ on-going relationship towards a GSD project outcome on the basis of following dimensions: knowledge sharing, trust, team commitment, and knowledge transfer. In addition, in this study we seek to evaluate the IT service quality through the lens of IT service climate delivered by GSD teams’. Therefore, consistent with earlier studies on IT service quality and IT service climate, an item is classified from the six dimensions (as shown in Table 6.1) that are most related to the IT service sectors.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsiveness</td>
<td>Willingness or readiness of team members’ interaction in order to provide service.</td>
</tr>
<tr>
<td>Competence</td>
<td>Possession of the required technical and functional knowledge and skills with respect to perform service.</td>
</tr>
<tr>
<td>Reliability</td>
<td>Involves consistency of performance and dependability of team members.</td>
</tr>
<tr>
<td>Creditability</td>
<td>Involves trustworthiness and believability nature of people.</td>
</tr>
<tr>
<td>Understanding</td>
<td>Involves understanding client’s specific requirements</td>
</tr>
<tr>
<td>Tangibility</td>
<td>Technology availability in order to provide the service</td>
</tr>
</tbody>
</table>

Table 6.1: Criteria for Evaluating IT service quality in the Context of GSD team-level service climate.

As a result twenty-five instrument items are used to measure the gaps between IT service climate and GSD project outcome perceptions on six dimensions of IT
service quality - responsiveness, competence, credibility, understanding, and tangibility (as shown in Table 6.2).

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Responsiveness (C₁)</strong></td>
<td>Participation and support to solve issues (C₁₁), persistent, conscientious responsiveness information (C₁₂), mutual coordination among team members (C₁₃), understanding the project requirements (C₁₄), participation and communication relationship (C₁₅)</td>
</tr>
<tr>
<td><strong>Competence (C₂)</strong></td>
<td>Clear objective to initiate the project in a GSD environment (C₂₁), knowledge incentive towards client business process and project outcome (C₂₂), build up a pilot knowledge between teams (C₂₃), capacity to absorb technical and business knowledge (C₂₄), brainstorming actions for organizations (C₂₅)</td>
</tr>
<tr>
<td><strong>Reliability (C₃)</strong></td>
<td>feeling of togetherness or closeness among team members(C₃₁), cooperation towards project outcome(C₃₂), arduous relationship among team members(C₃₃), participation in helping each other(C₃₄)</td>
</tr>
<tr>
<td><strong>Credibility (C₄)</strong></td>
<td>trust relationship among teams(C₄₁), team members understanding their roles in GSD project(C₄₂), faith and interest of employees(C₄₃), flexibility and beneficial decisions among teams(C₄₄)</td>
</tr>
<tr>
<td><strong>Understanding (C₅)</strong></td>
<td>project functionality towards client’s business process(C₅₁), understand the process with respect to the implementation(C₅₂), mutual understanding towards the process(C₅₃), understanding the goals, task and responsibilities over the client’s business process(C₅₄)</td>
</tr>
<tr>
<td><strong>Tangibility (C₆)</strong></td>
<td>Participation, acceptance and learning incentive of innovative technology (C₆₁), explicit and standard communication pattern in the GSD environment (C₆₂), learning, and sharing the work materials of employees (C₆₃)</td>
</tr>
</tbody>
</table>

Table 6.2: IT Service Quality Criteria with Respective GSD Team-Level Service Climate Attributes

The service climate attributes are determined via extensive investigations with various professionals, including the executive committee, solution development team, and solution delivery team. Synthesizing literature reviews from (Parasuraman et al.,
1985; Jia Ronnie et al., 2008; Schneider et al., 1993; Ronnie Jia et al., 2013; Tsung-Han Chang et al., 2009; Pitt et al., 1995; Campion et al., 1993; Oldham et al., 1996; Schneider et al., 1998) the views from the GSD teams are employed to obtain the twenty-five team-level service climate attributes which is vividly shown in Table 6.2. To ensure the internal consistency of the decision hierarchy Cronbach’s alpha was computed in order to validate the reliability of the constructs. The greater the value of Cronbach’s alpha, the more reliable the questionnaire. Commonly, the acceptable level of Cronbach’s alpha is higher than 0.7. Moreover, Cronbach’s alpha values (shown in table 6.3) of the constructs exceeds 0.7 which shows that all the constructs got have adequate levels of internal consistency.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsiveness</td>
<td>0.737</td>
</tr>
<tr>
<td>Competence</td>
<td>0.794</td>
</tr>
<tr>
<td>Reliability</td>
<td>0.870</td>
</tr>
<tr>
<td>Creditability</td>
<td>0.837</td>
</tr>
<tr>
<td>Understanding</td>
<td>0.910</td>
</tr>
<tr>
<td>Tangibility</td>
<td>0.935</td>
</tr>
</tbody>
</table>

Table 6.3: Cronbach’s Alpha Values of IT Service Quality Criteria

6.5 DATA ANALYSIS AND RESULTS

6.5.1 ANALYZE THE DEGREE OF IMPORTANCE

The respondents were asked to give their subjective judgments about the importance of weights of each aspect with respect to its attribute by using 5-point linguistic scales which include strongly disagree, disagree, neither agree nor disagree, agree and strongly agree.

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsiveness(0.272)</td>
<td>C11(0.210), C12(0.213), C13(0.112), C14(0.245), C15(0.219)</td>
</tr>
<tr>
<td>Competence(0.199)</td>
<td>C21(0.213), C22(0.245), C23(0.219), C24(0.211), C25(0.112)</td>
</tr>
<tr>
<td>Reliability(0.172)</td>
<td>C31(0.236), C32(0.251), C33(0.234), C34(0.279)</td>
</tr>
<tr>
<td>Creditability(0.089)</td>
<td>C41(0.226), C42(0.273), C43(0.226), C44(0.274)</td>
</tr>
<tr>
<td>Understanding(0.273)</td>
<td>C51(0.231), C52(0.355), C53(0.194), C54(0.220)</td>
</tr>
<tr>
<td>Tangibility(0.075)</td>
<td>C61(0.362), C62(0.294), C63(0.345)</td>
</tr>
</tbody>
</table>

Table 6.4: Average Degree of Importance of IT Service Quality Aspects
The respondents’ linguistic scales with equivalent triangular fuzzy numbers are discussed in Chapter 5 and Section 5.3.1. Meanwhile, it is not possible to find critical criteria to evaluate IT service quality before making the evaluation by the IT respondents. As a result, this study employs two data sets 100 fuzzy input-output patterns and 50-100 fuzzy input-output patterns corresponding to each evaluation have been aggregated.

Consequently, this study adopts genetic algorithm based learning approach (e.g. Yi-Chung Hu and Pen-Che Liao et al., 2011; Yi-Chung Hu 2009) which is used to determine the degrees of importance of respective aspects and attributes according to the data sets. The average degree of importance of IT service quality criteria, service climate dimension with respect to GSD teams’ service climate attributes are shown in Table 6.4 and Table 6.5.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managerial Practices(0.549)</td>
<td>C11(0.156),C12(0.157),C14(0.181),C15(0.162),C24(0.161),C52(0.184)</td>
</tr>
<tr>
<td>Service Leadership(0.430)</td>
<td>C13(0.083),C21(0.084),C22(0.087),C23(0.089),C31(0.100),C32(0.107),C34(0.118),C51(0.119),C53(0.100),C54(0.118)</td>
</tr>
<tr>
<td>Global service climate(0.021)</td>
<td>C25(0.082),C33(0.100),C41(0.093),C42(0.112),C43(0.093),C44(0.112),C61(0.148),C62(0.120),C63(0.141)</td>
</tr>
</tbody>
</table>

Table 6.5: Average Degree of Importance of IT Service Climate Dimensions

This study reveals the average degree of importance of IT service quality criteria which was categorized into six major aspects and 25 service climate attributes are summarized in Table 6.1. Furthermore, these 25 service climate attributes are classified under three IT service climate dimensions to determine relationship between GSD team-level service climate and GSD project outcome in the context of IT service quality. Similarly, the results (as shown in Table 6.4) show that more concerned IT service quality aspects are responsiveness (C1), understanding (C5), competence (C2), and reliability (C4) with respect to GSD team-level service climate attributes. Subsequently, the average degree of importance (shown in Table 6.5) of IT service climate dimension such as managerial practices, service leadership aspects are more concerned IT service climate dimensions with respect to GSD team-level service climate attributes.
<table>
<thead>
<tr>
<th>Aspects</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsiveness</td>
<td>C11(0.057),C12(0.058),C13(0.031),C14(0.067),C15(0.060)</td>
</tr>
<tr>
<td>Competence</td>
<td>C21(0.042),C22(0.049),C23(0.043),C24(0.042),C25(0.022)</td>
</tr>
<tr>
<td>Reliability</td>
<td>C31(0.041),C32(0.043),C33(0.040),C34(0.048)</td>
</tr>
<tr>
<td>Creditability</td>
<td>C41(0.002),C42(0.002),C43(0.002),C44(0.002)</td>
</tr>
<tr>
<td>Understanding</td>
<td>C51(0.063),C52(0.097),C53(0.053),C54(0.060)</td>
</tr>
<tr>
<td>Tangibility</td>
<td>C61(0.027),C62(0.022),C63(0.026)</td>
</tr>
</tbody>
</table>

Table 6.6: Average Global Weights of IT Service Quality Aspects

These results clearly indicate that GSD team-level service climate attributes should have significant impact on IT service quality and GSD project outcome relationship. The degree of importance of service climate attributes can be compared to each other by calculating the global weights of respective attributes. The results are shown in Table 6.6 and Table 6.7.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managerial Practices</td>
<td>C11(0.086),C12(0.086),C14(0.100),C15(0.089), C24(0.088),C52(0.100)</td>
</tr>
<tr>
<td>Service Leadership</td>
<td>C13(0.036),C21(0.036),C22(0.037),C23(0.038), C31(0.043),C32(0.046),C34(0.051),C51(0.051), C53(0.043),C54(0.049)</td>
</tr>
<tr>
<td>Global service climate</td>
<td>C25(0.017),C33(0.021),C41(0.019),C42(0.024), C43(0.018),C44(0.024),C61(0.032),C62(0.025) C63(0.030)</td>
</tr>
</tbody>
</table>

Table 6.7: Average Global Weights of GSD Team Service Climate Dimensions

6.6 RESULTS AND DISCUSSION

Measuring IT service quality, IT service climate are mentioned as objectives for motivating GSD project outcome relationship, thus evaluating GSD team-level service climate attributes through IT service quality criteria and IT service climate dimensions. This study suggests a framework with the combination of FMCDM and GA based approach for evaluating the IT service quality in the context of GSD team-level service climate and GSD project outcome relationship. The findings show that GSD team-level service climate attributes have a significant effect on IT service quality from the perspective of GSD projects.
The earlier studies discussed in Chapter 3 used the traditional likert scale for evaluating the GSD teams’ partnership quality. The Likert scale cannot deal with cognitive uncertainty arising from human thinking and perception process (Cronin and Taylor 1992; Yi-Chung Hu and Pen-Che Liao 2011). Therefore, this study employs fuzzy set theory (fuzzy numbers) to deal the uncertainty and subjective vagueness within the decision-making process. The average degree of importance of IT service quality, service climate aspects and service climate attributes are presented in Table 6.4 and Table 6.5. The global contribution to the IT service quality, service climate aspects towards the objective has been expressed through calculation of global weights of individual service climate attributes (shown in Table 6.6 and Table 6.7).

![Figure 6.2: Average Global Weights: IT Service Quality and Service Climate Aspects](image)

The results show that participation and support to solve issues (C₁₁), persistent, conscientious responsiveness information (C₁₂), participation and communication relationship (C₁₅), capacity to absorb technical and business knowledge (C₂₄), understand the process with respect to the implementation (C₅₂); these factors are more concerned under managerial practices IT service climate dimension in order to deliver quality of service with respect to IT service quality criteria. Likewise, feeling of togetherness or closeness among team members (C₃₁),
cooperation towards project outcome ($C_{32}$), participation in helping each other ($C_{34}$), project functionality towards client’s business process ($C_{51}$), mutual understanding towards the process($C_{53}$), understanding the goals, task and responsibilities over the client’s business process are the attributes that have greater values in order to set goals, work planning and coordination activities with respect to GSD project service leadership dimension.

In addition, the average global weights of IT service climate dimension with respect to service climate attributes such as $C_{11}, C_{12}, C_{14}, C_{15}, C_{24}$ and $C_{52}$ values are above 0.08 (shown in Fig 6.2) specifies that GSD team-level service climate attributes reveal key determinant in the context of IT service quality and GSD project outcome relationship. Similarly, the results (see Fig 6.2) show that average global weights of IT service quality with respect to service climate attributes such as $C_{14}, C_{15}, C_{51}, C_{52}$, and $C_{54}$ values exceeded 0.06 (see Fig 6.2) that indicates that GSD team-level service climate attributes have significant impact towards IT service quality. Similarly, average global weights of IT service quality dimension such as responsiveness and understanding aspect values are high as compare than other aspects (see Fig 6.3 and Table 6.6). 

Thus, our study emphasizes that GSD team-level service climate attributes should have a significant effect on IT service quality in order to achieve outcome/success of the GSD project from the service providers’ perspective.

![Figure 6.3: Average Global Weights IT Service Quality Dimensions](image-url)
6.7 SUMMARY

This chapter reveals IT service quality through the lens of GSD teams’ service climate and GSD project outcome relationship. Furthermore, this chapter elaborates the methodology to measure IT service quality in the context of TSC, it includes three dimensions which covers twenty five climate attributes for evaluating TSC in GSD project is presented. The relative importance of IT service quality, service climate aspects with respective GSD team-level service climate attributes are determined by the proposed FMCMD with GA approach.