Chapter 3
RESEARCH METHODOLOGY

3.1 OVERVIEW OF THE DESIGN OF STUDY

The literature review discussed in the previous chapter clearly establishes the fact that despite a plethora of models and studies on antecedents of employability, the gap continues to prevail and grow. Further, in context of Information Technology sector in India, it is evident that the skill shortages are prevalent and that there is a rising trend in the employability gap. Nasscom (2014) reports that the employability of graduates has become a serious issue and therefore, nurturing the right talent for this sector is but imperative.

Therefore, in view of the same, it is critical to identify such factors that act as the predictors of employability explicitly in context of the Information Technology sector. These factors would highlight such generic and domain specific attributes that the employers consider significant while hiring graduates. These factors when acquired are anticipated to enhance the graduate employability and increase their chances of securing potential jobs in the sector. The identification of these factors would enable to develop a conceptual model of research for the present study. Furthermore, leveraging on the same, the perception of the key stakeholders i.e. employers and graduates, on these factors that are considered crucial for employability, can be measured and compared for examining perceptual differences. The perceptual analysis of these two key stakeholder groups enables to analyse the areas of differences in the viewpoints that originate and augment the employability gap.

This chapter illustrates the research design used for the present study. It outlines the different phases of strategic assessment of employability gap that has been adopted in this study, delineates the research constructs i.e. the macro and the micro variables and the hypothesized relationship among them. The research model conceptualized for the purpose of this study is depicted. Further, the framework and the approach used for the conduct of this research has been discussed highlighting the techniques used for data collection, validation and analysis.
3.2 THEORETICAL PERSPECTIVES

The conceptual review of literature highlights that employability is a complex and multidimensional construct that can be examined from various perspectives. The wide array of definitions and dimensions of employability that have been proposed, highlight the multifaceted nature of the construct. For this study, employability is considered as the “ability to get initial employment, maintain employment and obtain new employment if required” as proposed by Hillage and Pollard (1998). This section delineates the meaning and dimensions of employability and elaborates the theoretical perspectives of the present study to address this issue with a structured and clear approach.

This study under consideration examines employability from the standpoint of individual factors, focussing on the skills and knowledge areas of potential job seekers deemed necessary for employment. On a broader parlance, it attempts to address the issue of the quality of entry level human resource for potential technical jobs in Indian Information Technology sector. Employability gap has been further assessed by considering the perceptions of the two key stakeholder groups, i.e. employers and potential job seekers on the significance of the predictors of employability. The comparison of their opinions highlights the perceptual differences between the two groups that can further magnify the employability gap and impact the quality of future manpower for this sector. Therefore, this study is an attempt to modestly contribute to the Stakeholder Theory of organizational management and business ethics proposed by Freeman (1984) and the Resource Based View of competitive advantage of a firm given by Barney (1991).

The Stakeholder Theory takes into consideration the “principle of who or what really counts” (Freeman, 1984). The theory identifies the stakeholder groups of an organization and recommends techniques by which the management can give due regard to the interest of these groups. Stakeholder theory has gained much significance in the field of higher education since the late 20th and 21st centuries. Bjørkquist (2010) argues that in context of higher education, stakeholder is anyone with a reasonable interest in education who thereby acquires a right to intervene. Students and employers are significant stakeholders in education (Leisyte and
Westerheijden, 2014). Therefore, by giving due regard to the perceptions of these two dominant stakeholder groups, this study supplements the stakeholder theory.

The resource based view analyses firms from the resource side in order to identify key potential resources or capabilities that a firm possesses which are rare, inimitable, valuable and non-substitutable. Such resources enable a firm to gain sustainable competitive advantage. Underlining the employability of graduates and in turn the quality of future manpower for IT companies, the present study analyses one of the most crucial resource/capability for a firm i.e. its human resource. Therefore, by way of focusing on the human resource, this study augments the resource based theory of organization.

3.3 RESEARCH OBJECTIVES

As outlined in chapter 1, the research objectives for this study have been reiterated below for the further elaboration of research design in sync with these aims.

1. To identify the antecedents/factors that influence graduate employability, in general and in the context of IT sector in India.
2. To study the interrelationship among these factors of employability identified from the literature
3. To develop the conceptual framework of factors affecting and validate from the perspectives of the two key stakeholder groups i.e. employers and potential job seekers (graduates) in Indian IT sector.
4. To analyse the perceptual difference among the two key stakeholder groups (graduates and employers) with respect to these factors.
5. To highlight the areas of perceptual differences between the two key stakeholders (employers and graduates) that contribute to employability gap and suggest ways to address it.

3.4 PHASES OF STRATEGIC ASSESSMENT ADOPTED IN THE STUDY

The present study adopts a strategic approach to assess the nature of employability gap prevalent in the Indian Information Technology sector. The literature review (elaborated in Chapter 2) clearly indicates that there are gamuts of intrinsic or
individual factors like knowledge, skills and competencies that influence employability. Further the external factors like personal circumstances, job market and economic conditions influence individual’s ability to actualize the acquired employability. However, it is presumed in this study that these external factors are common to all potential job seekers and come into action only at the level of actualizing employability, once these graduates are acknowledged as employable.

However, the mere problem of employability gap originates at the level wherein it is largely realized by the industry that the graduates are not job ready and are seriously deficient in the required knowledge and skill areas. This clearly indicates that they are not employable at the preliminary stance, leave apart the external factors to actualize employability.

Acknowledging the skill deficit and qualitative demand supply mismatch of human resource that is leading to serious manpower shortages in the Indian Information Technology sector, this study examines employability and the gap from the perspective of acquiring employability rather than actualizing employability that comes into play at a later stage. Therefore, the study focusses on individual factors encompassing knowledge, skills and other vital competencies that enable potential employees to secure and maintain employment. Further, in the absence of an established framework for the predictors of employability specifically in context of Information Technology sector, a conceptual model of research has been developed and validated by two key stakeholder groups i.e. employers and potential employees. This model is further deployed to analyse the employability gap through perceptual analysis of these two key stakeholders.

Also, it is crucial to underline that this study does not intend to measure employability gap in quantitative terms as these statistics have already been much highlighted in the literature, rather an attempt has been made to identify the root cause and assess the nature of employability gap from a distinct dimension i.e. perceptual analysis of the two key stakeholder groups (employers and graduates). Such an analysis reveals the perceptual differences and a mismatch of opinions on the fundamental factors that influence employability which in turn lead to augmenting the existing employability gap. Though the traces of perception differences can be attributed from the literature (Lee et al.,2002; Turner and Lowry,
1999; Wickramasinghe and Perera, 2010), however, such studies are mere observations and there are no studies to substantiate such perceptual differences through a conceptual model. Thus, one of the basic theoretical premise of this study is that the perceptual differences between the two key stakeholder groups constitutes and augments the employability gap besides the usual factors like lack of academia industry integration or deficiencies in higher education system, that have been discussed profoundly by the past researches. This section elaborates the tactical approach by detailing the different phases that have been adopted for the strategic assessment.

**Phase 1: Understanding the nature of employability and the factors influencing it in context of Information Technology sector.**

It can be inferred from the review of literature that employability is complex and multifaceted construct. The literature highlights a wide array of definitions and factors that influence employability. This phase attempts to clearly define employability and identify the factors that influence the employability of fresher job seekers, specifically in context of Information Technology sector.

**Phase 2: Qualitative analysis and hierarchical modeling of the factors that influence graduate employability**

The factors influencing graduate employability that have been retrieved from the literature in Phase 1 are subjected to preliminary validation by the industry experts in this phase. Through the Total Interpretive Structural Modeling (TISM) technique, qualitative analysis has been done and a hierarchical model of the factors influencing graduate employability in Information Technology sector is established.

**Phase 3: Formulation and Validation of comprehensive model of the factors influencing graduate employability in Information Technology sector**

Further to the phases listed above, a conceptual model of the factors affecting graduate employability in Information Technology sector is proposed. This includes three macro variables and six micro variables encompassing technical and non-technical areas that are found to influence employability. Further, the developed
model is empirically validated by two key stakeholder groups i.e. employers and potential job seekers.

**Phase 4: Assessment of Employability Gap through Perceptual Analysis of Key Stakeholders**

The conceptual model of research established in Phase 3 is further assessed in this phase to capture and compare the perceptions of the two key stakeholder groups i.e. employers and graduates on the significance of the factors that influence employability. Such a perceptual analysis enables to clearly delineate the areas of perception differences between the employers and graduates with respect to the factors that influence employability. The perceptual differences highlighted at this stage are assumed to contribute to and magnify the existing employability gap.

**Phase 5: Proposing Recommendations to Bridge the Employability Gap by plugging in Perceptual Differences.**

Based on the results of the empirical study and the analysis of employability gap through perceptual differences as described in Phases 3 and 4, this phase proposes recommendations to address the perceptual differences between the two stakeholder groups, in order to bridge the employability gap.

**3.5 RESEARCH CONSTRUCTS / VARIABLES**

One of the basic objectives of the present study is to measure and compare the perceptions of key stakeholders with respect to the significance of the different factors that influence graduate employability, in order to identify the areas of perceptual differences that contribute to employability gap. This necessitates the need to identify the research constructs and translate them into a research model that can be deployed for further investigation and analysis.

The research constructs used in the present study have been largely derived through the extensive review of literature that spans across both employability and skills, in general, and studies especially in the context of Information Technology and allied technical sectors.
With reference to the Information Technology sector, the review of literature brings out a wide array of attributes that are significant for graduate employability. Further analyzing these attributes, it is quite evident that core technical knowledge no longer acts as the sole determinant of graduate employability in the sector. The changes in consumer and business preferences, globalization and increased competition have changed the structure and functioning of organizations. As a result, traditional proficiency requirements, especially for the entry-level positions, have been changing (Eom and Lim, 2012).

The technology and the world of work is changing at a fast pace and so are the demands of the employers. In today’s dynamic and competitive business environment, it is both technical and non-technical skills that are considered critical by the recruiters (Lee et al., 1995; Tesch et al., 2008; Fang et al., 2005; Benamati, 2007; McMurtrey, 2008; Aasheim et al., 2009; Aasheim and Williams, 2009). Considering these broad categories of “technical” and “non-technical skills” as fundamental, the key skills that subgroup these all-encompassing categories have been delineated as the research variables for this study. The research variables in this study have been categorized as “macro” and “micro” variables. The macro variables imply the first order variables that are constituted by various sub variables. These sub variables are termed as “micro variables” indicating that these are second order variables and a subset of the respective macro variable.

3.5.1 Identification of Research Variables for Study

It has been discussed in the preceding section that the research variables used in the present study have been drawn from the review of literature. The plethora of models and measures for various sectors put forward by past researches, have added to the clutter and confusion to the field, making the task of variable identification much more complex. After a thorough perusal of the past studies, however, a comprehensive model with three macro constructs namely Technical Skills, Organizational Knowledge and Personal and Interpersonal Skills have been proposed as the predictors of the dependent macro variable of “Employability”. The macro research constructs are further constituted of micro variables, which have been listed in Table 3.1 and discussed in detail in subsequent sections. The proposed research
model with the taxonomy of research variables, drawing from various past researches, is much more comprehensive and unique to this study.

Table 3.1: List of Variables Used in the Research

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Macro Variables (Code) (No. of micro variables)</th>
<th>Micro Variables</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Technical Skills (TS) (2)</td>
<td>Technical Specialties Knowledge</td>
<td>Lee et al. (1995).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technology Management Skills</td>
<td>Aasheim et al. (2012); Trauth et al. (1993); Lee et al. (2002); Nelson (1991); Yen et al. (2001); Aasheim and Williams (2009)</td>
</tr>
<tr>
<td>2</td>
<td>Organizational Knowledge (OK) (0)</td>
<td>Nelson (1991); Yen et al. (2001); Fang et al. (2005); Bassellier and Benbasat (2004); Aasheim et al. (2009).</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Personal and Interpersonal Skills (PIS) (4)</td>
<td>Problem Solving and Critical Thinking Skills</td>
<td>Tesch et al. (2008); Lees (2002); Rosenberg (2012); Yen et al. (2001); McMurtrey et al. (2008); Lee et al. (2002); Ju et al. (2011); Turner and Lowry (1999); Woratschek and Lenox (2002); McMurtrey et al. (2008), Wickramasinghe and Perera (2010); Lees (2002), Singh et al. (2008); Ramli (2010); Ju et al. (2011).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communication Skills</td>
<td>Bailey and Mitchell (2006); Aasheim et al. (2009); Fang et al. (2005); Benamati (2007); Tesch et al. (2008); Woratschek and Lenox (1999); Lee et al. (1995); Eom and Lim (2012); McMurtrey et al. (2002); Havelka and Merhout (2006)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creative Thinking Skills</td>
<td>Fang et al. (2005); Wickramasinghe and Perera (2010); McMurtrey et al. (2008); Ju et al. (2011); Yen et al. (2001); Tesch et al. (2008); Lee et al. (2002); Wen et al. (2001); Aasheim et al. (2012)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teamwork and Interpersonal Skills</td>
<td>McMurtrey et al. (2008); Aasheim et al. (2012); Woratschek and Lenox (2002); Tesch (2008); Singh et al. (2013); Blom et al. (2011); Bailey and Mitchell (2006); Aasheim et al. (2009); Fang et al. (2005) and interpersonal skills</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interpersonal Skills</td>
<td>Rosenberg et al. (2012); Aasheim et al. (2012); Nelson (1991); Trauth et al. (1993); Ramli (2010); Bassellier et al. (2004)</td>
</tr>
</tbody>
</table>
3.5.2 Macro Constructs

This section presents a brief explanation of the three macro independent variables and one macro dependent variable used in the study.

Technical Skills

Technical skills represent the core knowledge of the field. These skills often refer to the “hard skills” of a job. This set of skills reflect the knowledge, aptitude and know-how, largely acquired through learning and practice in order to perform a certain job. The technical skills that are sought after by employers are often job specific. Every job has its own inherent requirements and hence the required hard skills are different.

In context of the Information Technology sector, these skills refer to the technical proficiencies and competencies of an individual that spans across hardware, software, networking, operating systems and other allied areas. Besides, it is crucial to realize that the technology is changing at a fast pace and so are the technical competencies to perform the job. Therefore, realizing the rapid rate of technological change, it is essential for an individual to understand the changing trends in technology and learn new technologies to keep themselves updated and competitive in this demanding sector. This need for updated technical knowledge and skills is one of most fundamental and inherent requirements from Information Technology professionals to perform their job satisfactorily. The measure of such skills is used by the employers to screen candidates for potential jobs and have been used by many researches in the past (Lee et al., 1995, Aasheim et al., 2012; Trauth et al., 1993; Lee et al., 2002; Nelson, 1991; Yen et al., 2001; Asheim and Williams, 2009).

In light of the discussion above and acknowledging the significance of technical knowledge from the literature summarized in Table 2.4, Technical Skills form one of macro constructs of this studies. This further includes two micro variables- Technical Specialties knowledge and Technology Management Skills in line with the findings of Lee et al. (1995).
Thus, technical skills, in the context of the present study imply the core technical knowledge and proficiencies of an individual coupled with his ability to keep abreast with the technology changes and apply them when required.

**Organizational Knowledge**

In context of the information technology sector, the dynamic role of technical graduates cannot be viewed with narrow perspective. The significant and changing role of information technology must be acknowledged. In the present era, information technology plays a crucial role in achieving organization’s goals and objectives and executing organization wide tasks and business oriented activities. As a result, the traditional technical skills focusing heavily on technical knowledge and competencies no longer suffice (Eom and Lim, 2012). The author also highlights that apart from leveraging the use of technology to support business functions and daily operations, the technical personnel must be able to collaborate with the end users to achieve business goals and meet the technical needs. This clearly implies that besides his technical competencies, the individual should be able to understand organizational goals, analyze business problems, align technology in sync with the business goals and develop technical solutions that match the business needs.

Therefore, apart from technical skills, organizational knowledge is considered equally important by recruiters. As can be inferred from Table 2.4, the importance of such skills has also been widely acknowledged in the literature under different taxonomies like Business Knowledge, Functional Knowledge, Business Skills, Business Expertise Business Functional Knowledge (Lee et al. 1995; McMurtrey et al.,2002; Boyle and Strong, 2006; Noll and Wilkins, 2002; Bailey and Mitchell ,2006; Havelka and Merhout, 2006).

In light of the discussion above, Organizational Knowledge is considered as the macro construct of the present study (Nelson 1991; Yen et al.,2001; Fan et al.,2005; Bassellier and Benbasat, 2004; Aasheim et al.,2009). This construct can be described as the generic knowledge of a technical graduate about the organization, business functions and industry the he/she operating in. Therefore, a measure of organizational knowledge includes knowledge of specific business functional area, specific industry, specific organizations and of general business environment.
**Personal and Interpersonal Skills**

The importance of personal and interpersonal skills in making graduates employable flows seamlessly across all industries. Often known as soft skills or transferable skills, these represent the generic skills which can support study in any discipline, and which can potentially be transferred to a range of contexts, in higher education or the workplace. These skills are key determinants of employability included in almost all models of employability and are widely accepted by literature (Pool and Sewell, 2007; Bridgstock, 2009; Knight and Yorke, 2002; Mayer, 1992; Australian Chamber of Commerce and Industry and Business Council of Australia, 2002).

In context of Information Technology sector, these skills play a vital role for technical professionals. For information technology positions, these soft skills are significant and they enhance future learning and productivity for career progression (McMurtrey et al., 2002). The importance of these skills are quite evident in a plethora of literature, especially focused on Information Technology and allied technical sectors under different terminologies like soft skills, personal skills, interpersonal skills, generic skills, employability skills, personal traits, people skills, non technical skills to mention a few. Several research studies that have been conducted from standpoints of different stakeholders like employers, academicians and graduates have highlighted the significance of these skills. (Eom and Lim, 2012; Havelka and Merhout, 2006; Benamati, 2007; McMurtrey et al., 2002; Lee et al., 2002; Debuse and Lawley, 2009).

Acknowledging the vital significance of these skills, the crucial soft skills have been clustered for this study under the macro construct Personal and Interpersonal Skills. Defining in context of this study, personal skills refer to the personal abilities in knowing and managing oneself and interpersonal skills imply the skills in working effectively with others (Tesch et al. 2008). These two skills have been recognized by various studies focused on the information technology and information science sectors and has been found significant. (Aasheim et al., 2009, Bassellier and Benbasat, 2004; Fang et al., 2005; Young and Lee, 1996; Lee et al., 2002; Trauth et al., 1999; Tesch et al, 2008; Yen et al., 2001; Lee et al., 1995)
Employability

“Employability” is considered as the dependent macro variable for the present study. Chapter 2 discusses the various definitions that have been put forward for employability. In context of this study, employability is comprehended as the ability to get initial employment, maintain employment and obtain new employment if required (Hillage and Pollard, 1998). Based on the various well established models and frameworks of employability that have been discussed in Chapter 2, it can be inferred that significant knowledge, skills and other personal attributes tend to affect the graduate employability. In context of information technology sector, it is assumed that the employability of graduates is dependent on the three identified independent macro variables i.e. technical skills, organizational knowledge and the personal and interpersonal skills of these graduates.

3.5.3 Micro Constructs

The macro constructs discussed in the previous section can be further constituted of micro variables. These are discussed below:

Micro Variables Related to Technical Skills

Technical Specialities Knowledge / Skills

The significance of technical specialties knowledge / skills for information technology professionals cannot be ignored (Lee et al., 1995). It is notable from Table 2.4 that nearly all research studies have acknowledged the significance of these skills for graduates, though under different terminologies like technical knowledge, core competence, and technological skills or by simply elucidating its components. Aasheim et al. (2012) inferred that technical skills sought after by employers from entry level information technology workers include hardware, networking, security, database and operating systems. Based on the review of literature, the measure of technical knowledge for this study covers a range of technical specialties that include Hardware, Software (packaged products, operating systems, networking /communication software, and programming languages), and system development and maintenance (system analysis / design / development methodologies /approaches).
Technology Management Skills

This area of skills are concerned with effective deployment of information technologies to achieve business objectives (Lee et al., 1995). The author describes the measure of technology management knowledge as ability to learn new technology, understand technological trends and ability to apply technology as means. Similar measures have been also been used in other research studies while assessing the skills of IT / IS professionals (Aasheim et al., 2012; Trauth et al., 1993; Lee et al., 2002; Nelson 1991; Yen et al., 2001; Asheim and Williams, 2009).

Micro Variables Related to Personal and Interpersonal Skills

Communication Skills

These skills are one of the most sought after soft skills by recruiters while hiring graduates. In today’s challenging work environment, proficiency in written and verbal communication has become a key to success. For information technology professionals, the need to communicate both within and outside the organization is indispensable. This includes communication with team members, senior management, end users, clients and business partners. The significance of these skills can be endorsed from a plethora of literature in the area of skills and employability of graduates (Bailey and Mitchell, 2006; Aasheim et al., 2009; Fang et al., 2005; Benamati, 2007; Tesch et al., 2008; Woratschek and Lenox, 1999; Lee et al., 1995; Eom and Lim, 2012; McMurtrey et al., 2002; Havelka and Merhout, 2006).

Critical Thinking and Problem Solving Skills

The work profile of information technology professionals demands logical solutions to problems through the application of technology. Therefore, the professionals in this field are required to engage in rational and reflective thinking, synthesize ideas and provide reasoned judgments. Critical thinking enhances the ability to solve problems. The two components of critical thinking and problem solving is widely acknowledged by the literature either considered separately or taken together. Critical thinking skills have been inferred as significant by various research studies (Tesch et al., 2008; Lees, 2002; Rosenberg, 2012; Yen et al., 2001; McMurtrey et al., 2008; Lee et al., 2002; Ju et
The importance of problem solving skills has also been recognized by several authors (Turner and Lowry, 1999; Woratschek and Lenox, 2002; McMurtrey et al., 2008, Wickramasinghe and Perera, 2010, Lees, 2002, Singh et al., 2008, Ramli, 2010; Ju et al., 2011). However, for the purpose of this study, these two parallel components have been collated together.

**Creative Thinking Skills**

It refers to the ability to think innovative and generate new ideas to have different approach to business problems. It provides the ability to analyze the problems from a new perspective and provide unorthodox solutions. In this present era of stiff competition, creative thinking skills of professionals enables the organization to gain edge over the competitors. The significance of such skills have been acknowledged widely in the literature (Fang et al., 2005; Wickramasinghe and Perera, 2010; McMurtrey et al., 2008; Ju et al., 2011; Yen et al., 2001; Tesch et al., 2008; Lee et al., 2002; Wen et al., 2001; Aasheim et al., 2012)

**Teamwork and Interpersonal Skills**

It refers to the ability of working in groups and exhibit interpersonal behavior and communication capabilities. The information technology professionals are required to work in teams, deal with group dynamics and participate in social interactions. These skills enable a person to interact positively and work effectively with others. Several research studies have highlighted the importance of teamwork (McMurtrey et al., 2008; Aasheim et al., 2012; Woratschek and Lenox, 2002; Tesch, 2008; Singh et al., 2013; Blom et al., 2011; Bailey and Mitchell, 2006; Aasheim et al., 2009; Fang et al., 2005) and interpersonal skills (Rosenberg et al., 2012; Aasheim et al., 2012; Nelson, 1991; Trauth et al., 1993; Ramli, 2010; Bassellier et al., 2004). These two interlinked skills have been integrated for this study.

### 3.6 RESEARCH FRAMEWORK

The conceptual framework for the research hypothesizing possible linkage of the independent variables – Technical skills, Organizational Knowledge and Personal and Interpersonal Skills and the dependent variable - Employability is depicted below:
The framework depicts generic relationships between the independent and dependent macro and micro variables. Some specific relationships among the constructs have been hypothesized drawing from the past researches and qualitative modelling that has been elaborated in Chapter 4. The above proposed model shall be further used to test the hypothesis envisaged for this study, capture the perceptions of the two key stakeholder groups (employers and graduates) on the significance of identified variables depicted in the model and further analyse the perceptual differences that constitute to and widen the employability gap.

3.7 HYPOTHESIS FORMULATION

Subsequent to the formulation of research objectives and the conceptual framework for research, two sets of hypotheses can be formulated and tested for further analysis. These two sets include the hypothesis of association and hypothesis of difference.

3.7.1 Hypothesis of Association

The hypotheses of association have been envisaged in order to test the research framework that has been conceptualized for the purpose of this study. The same is depicted in Figure 3.1. These hypotheses have been formulated with the four sets of
macro variables that include the independent variables Technical Skills, Organizational Knowledge, Personal and Interpersonal Skills and the dependent variable, Employability. These hypotheses linking the independent and dependent macro variables may be presented as follows:

**Hypotheses of Association for Macro Variables**

*Null Hypotheses:* One macro independent variable is not a predictor of the dependent variable

*Alternate Hypotheses:* One macro independent variable is a predictor of the dependent variable. This is elaborated below:

- HATE: Technical Skills are predictors of Employability
- HAOE: Organizational Knowledge is predictors of Employability
- HAPIE: Personal and Interpersonal Skills are predictors of Employability

The summary of the hypotheses for macro variables is presented in Table 3.2

<table>
<thead>
<tr>
<th>Independent Macro Variable</th>
<th>Associated with Variable</th>
<th>Hypotheses Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Skills</td>
<td>Employability</td>
<td>HATE</td>
</tr>
<tr>
<td>Organizational Knowledge</td>
<td>Employability</td>
<td>HAOE</td>
</tr>
<tr>
<td>Personal and Interpersonal Skills</td>
<td>Employability</td>
<td>HAPIE</td>
</tr>
</tbody>
</table>

**Hypotheses of Association for Micro Variables**

The micro variables constituting the macro variable are assumed to affect the dependent variable of study. Hypotheses for micro variables may be constructed as follows:

*Null Hypotheses:* One micro independent variable is not a predictor of the dependent variable

*Alternate Hypotheses:* One micro independent variable is a predictor of the dependent variable.
The micro hypotheses for each macro variable of study and controlled impact of all the micro variables together is presented below. Further, these hypotheses for micro variables is depicted in a tabular form indicating that the independent variables of study are the predictors of dependent variables.

**Micro Hypotheses with Technical Skill Factors as the predictors of Employability**

The conceptual model of research shows that the macro variable “Technical Skills” has two micro variables- Technical Specialties Knowledge and Technology Management Skills. Both these micro variables are assumed to affect the dependent variable i.e. Employability. Based on the same, the alternate micro hypotheses with Technical Skills Factor may be formulated as follows:

HAT1E: Technical Specialties Knowledge (T1) is a predictor of Employability

HAT2E: Technology Management Skills (T2) is a predictor of Employability

**Micro Hypotheses with Personal and Interpersonal Skill Factors as the predictors of Employability**

The macro construct- Personal and Interpersonal Skills consists of four micro variables that includes Problem Solving and Critical Thinking Skills, Creative Thinking Skill, Communication Skills, Teamwork and Interpersonal Skills. All these micro variables are assumed to affect the dependent variable i.e. Employability. Based on the same, the alternate micro hypotheses with Personal and Interpersonal Skills Factor may be formulated as follows:

HAPI1E: Problem Solving and Critical Thinking Skills (PI1) is a predictor of Employability

HAPI2E: Creative Thinking Skills (PI2) is a predictor of Employability

HAPI3E: Communication Skills (PI3) is a predictor of Employability

HAPI4E: Teamwork and Interpersonal Skills (PI4) is a predictor of Employability

Table 3.3 depicts the summary of hypotheses of association for the six micro variables.
Table 3.3: Summary of Hypotheses of Association for Micro Variables.

<table>
<thead>
<tr>
<th>Independent Micro Variable</th>
<th>Associated With Dependent Variable</th>
<th>Hypotheses Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Specialties Knowledge</td>
<td>Employability</td>
<td>HAT1E</td>
</tr>
<tr>
<td>Technology Management Skills</td>
<td>Employability</td>
<td>HAT2E</td>
</tr>
<tr>
<td>Problem Solving and Critical Thinking Skills</td>
<td>Employability</td>
<td>HAPI1E</td>
</tr>
<tr>
<td>Creative Thinking Skills</td>
<td>Employability</td>
<td>HAPI2E</td>
</tr>
<tr>
<td>Communication Skills</td>
<td>Employability</td>
<td>HAPI3E</td>
</tr>
<tr>
<td>Teamwork and Interpersonal Skills</td>
<td>Employability</td>
<td>HAPI4E</td>
</tr>
</tbody>
</table>

- **Micro Hypotheses with controlled impact of all the micro variables together as the predictor of Employability**

The six micro variables of the study (two micro variables of Technical Skills and four micro variables of Personal and Interpersonal Skills) are together (under controlled impact) assumed to be a stronger predictor of employability in comparison to when these variables are considered separately. Accordingly, the alternate hypotheses of association under the controlled impact is formulated as follows:

HACIE: All the micro variables under the controlled impact (taken together) are strong predictors of employability.

Two sets of hypotheses of association for the three macro, six micro variables and one controlled impact of all the micro variables listed above are tested separately for each of the two key stakeholder groups under consideration i.e. employers and graduates, which are reported in Chapter 5 and 6 separately.

**3.7.2 Hypotheses of Difference**

One of the crucial assumptions of this study is that there exists a significant difference in the perceptions of graduates and employers on the factors that influence employability, which may be a plausible reason for employability gap. Accordingly, the hypotheses of difference have been formulated around this assumption to compare and test the difference in perception between these two stakeholder groups. The hypotheses of difference compares and tests the difference in the perception of two
key stakeholder groups i.e. graduates and employers with respect to the importance of the factors that influence graduate employability. The hypotheses of difference may be formulated and described below.

**Hypotheses of Difference Related to Macro Constructs**

These hypotheses of difference in relation to the three macro constructs may be formulated as follows:

- **Hypotheses of Difference for Technical Skills**

  *Null Hypotheses*: There is no significant difference in perception of graduates and employers with regard to the importance of Technical skills for employability

  *Alternate Hypotheses*: There is a significant difference in perception of graduates and employers with regard to the importance of Technical skills for employability

- **Hypotheses of Difference for Organizational Knowledge**

  *Null Hypotheses*: There is no significant difference in perception of graduates and employers with regard to the importance of Organizational Knowledge for employability

  *Alternate Hypotheses*: There is a significant difference in perception of graduates and employers with regard to the importance of Organizational Knowledge for employability.

- **Hypotheses of Difference for Personal and Interpersonal Skills**

  *Null Hypotheses*: There is no significant difference in perception of graduates and employers with regard to the importance of Personal and Interpersonal Skills for employability

  *Alternate Hypotheses*: There is a significant difference in perception of graduates and employers with regard to the importance of Personal and Interpersonal Skills for employability
These hypotheses of difference for the macro constructs have been summarized in the table below:

<table>
<thead>
<tr>
<th>Macro Variable</th>
<th>Hypotheses Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Skills</td>
<td>HDGETS</td>
</tr>
<tr>
<td>Organizational Knowledge</td>
<td>HDGEOK</td>
</tr>
<tr>
<td>Personal and Interpersonal Skills</td>
<td>HDGEPI</td>
</tr>
</tbody>
</table>

**Hypotheses of Difference Related To Micro Constructs**

The two independent macro constructs – Technical Skills and Personal and Interpersonal Skills further consist of micro variables. The hypotheses of difference in relation to the micro variables of these constructs may be formulated as follows:

- **Hypotheses of Difference for Micro Variables of Technical Skills**

The macro variable “Technical Skills” has two micro variables- Technical Specialties Knowledge and Technology Management Skills. The differences in the perception of graduates and employers on the importance of both these factors for employability need to be compared. Based on the same, the micro hypotheses with Technical Skills Factor may be formulated as follows:

i. **Micro Hypotheses for Technical Specialties Knowledge**

*Null Hypotheses:* There is no significant difference in perception of graduates and employers with regard to the importance of Technical Specialties Knowledge for employability

*Alternate Hypotheses:* There is a significant difference in perception of graduates and employers with regard to the importance of Technical Specialties Knowledge for employability

ii. **Micro Hypotheses for Technology Management Skills**
**Null Hypotheses**: There is no significant difference in perception of graduates and employers with regard to the importance of Technology Management Skills for employability

**Alternate Hypotheses**: There is a significant difference in perception of graduates and employers with regard to the importance of Technology Management Skills for employability.

- **Hypotheses of Difference for Micro Variables of Personal and Interpersonal Skills**

  Personal and Interpersonal Skills consists of four micro variables that includes Problem Solving and Critical Thinking Skills, Creative Thinking Skill, Communication Skills, Teamwork and Interpersonal Skills. Based on these variables, the micro hypotheses with Personal and Interpersonal Skills Factor may be formulated as follows:

  i. **Micro Hypotheses for Problem Solving and Critical Thinking Skills**

  **Null Hypotheses**: There is no significant difference in perception of graduates and employers with regard to the importance of Problem Solving and Critical Thinking Skills for employability

  **Alternate Hypotheses**: There is a significant difference in perception of graduates and employers with regard to the importance of Problem Solving and Critical Thinking Skills for employability

  ii. **Micro Hypotheses for Creative Thinking Skills**

  **Null Hypotheses**: There is no significant difference in perception of graduates and employers with regard to the importance of Creative Thinking Skills for employability

  **Alternate Hypotheses**: There is a significant difference in perception of graduates and employers with regard to the importance of Creative Thinking Skills for employability
iii. Micro Hypotheses for Communication Skills

_Null Hypotheses_: There is no significant difference in perception of graduates and employers with regard to the importance of Communication Skills for employability

_Alternate Hypotheses_: There is a significant difference in perception of graduates and employers with regard to the importance of Communication Skills for employability

iv. Micro Hypotheses for Teamwork and Interpersonal Skills

_Null Hypotheses_: There is no significant difference in perception of graduates and employers with regard to the importance of Teamwork and Interpersonal Skills for employability

_Alternate Hypotheses_: There is a significant difference in perception of graduates and employers with regard to the importance of Teamwork and Interpersonal Skills for employability

These hypotheses of difference for micro constructs have been summarized in table below:

**Table 3.5: Hypotheses of Difference for Micro Variables**

<table>
<thead>
<tr>
<th>Macro Variable</th>
<th>Micro Variable</th>
<th>Hypotheses Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Skills</td>
<td>1 Technical Specialties Knowledge</td>
<td>HDGETS1</td>
</tr>
<tr>
<td></td>
<td>2 Technology Management Skills</td>
<td>HDGETS2</td>
</tr>
<tr>
<td>Personal and Interpersonal Skills</td>
<td>1 Problem Solving and Critical Thinking Skills</td>
<td>HDGEPI1</td>
</tr>
<tr>
<td></td>
<td>2 Creative Thinking Skills</td>
<td>HDGEPI2</td>
</tr>
<tr>
<td></td>
<td>3 Communication Skills</td>
<td>HDGEPI3</td>
</tr>
<tr>
<td></td>
<td>4 Teamwork and Interpersonal Skills</td>
<td>HDGEPI4</td>
</tr>
</tbody>
</table>

### 3.8 RESEARCH METHODOLOGY

This section elaborates the logical approach that has been used for the execution of this research. The fundamental research design for this study is largely descriptive, though, exploratory approach has been adopted to investigate the interrelationships of variables. Accordingly, a conceptual research model is proposed and validated through empirical studies in order to meet the research objectives.
The research methodology adopted for the various phases of this study are elaborated below:

**Phase 1 : Literature Review –Identification of Research Variables**

An extensive review of literature has been conducted for this research which is reported in Chapter 2. Past researches related to employability and skills in general and specific to technical areas like Information Technology / Computer Science / Information Science has been prudently scrutinized. Various electronic databases have been used to retrieve the past researches on different relevant themes. The sources and the methodology adopted is discussed in subsequent section.

**Phase 2: Expert Interviews for Exploring Relationships Among Research Variables**

Sufficient information has been drawn from the literature for the purpose of identifying research constructs and formulating the conceptual research model. However, interviews were conducted with domain experts to elicit their inputs on the subject. This aimed at validating the research constructs and elucidate the interaction and relationships among the research variables for better clarity. For this, a qualitative technique called Total Interpretive Structural Modeling (TISM) has been used. The results of the same were significant in building the conceptual research framework. The detailed methodology and results of the same are reported in Chapter Four.

**Phase 3: Empirical Study for Hypotheses Testing**

A questionnaire based survey has been carried out the purpose of testing the hypotheses. Responses were solicited from the two stakeholder groups i.e. fresher graduates in Information Technology and allied courses and the employers in Information Technology Sector. Two separate questionnaires were designed to capture their perceptions on the significance of the various macro and micro constructs identified for the study. Also, the comparison of the responses from the two stakeholder groups enables to test the hypotheses of difference as formulated in the study (reported in Chapter 7). The proposed conceptual framework for this study has been empirically validated from the perspective of both employers and graduates using bivariate and multivariate data analysis techniques (reported in Chapter 5 and 6).
Phase 4: Synthesis of Results for Analysing Employability Gap through Perceptual Analysis

The employability gap is assessed in this stage through the perceptual analysis of key stakeholders. The empirical findings from two distinct opinion surveys of employers and graduates have been synthesized for the perceptual analysis of these two stakeholder groups. Such an analysis enables to delineate the areas of perceptual differences between these two groups on the factors influencing employability (depicted in Chapter 7). A clear delineation of the areas of perceptual differences enables to identify the reasons that can be attributed for widening the employability gap.

Phase 5: Triangulation of results, Conclusions and Recommendations

Triangulation has been used to facilitate data validation and cross verification. Data and methodological triangulation techniques have been used to enhance the credibility of the results of the study. Further, based on the findings, key conclusions have been highlighted and recommendations have been proposed. Finally, research contributions, limitations and directions for future research are also outlined.

The outline of the above methodology is depicted below:

![Figure 3.2: Phases in Research Methodology](image)

The research methodology employed for each phase is enumerated in the following subsections:

3.8.1 Methodology for Literature Review

Extensive literature review has been conducted for the purpose of this research. Key literature on areas like employability in general, skills and employability specific to information technology and allied sectors and perception differences between key
stakeholders has been investigated. The review has been done from reputed journals, books and articles. Foremost online sources like Elsevier, Emerald, EBSCO and Proquest have been explored for the purpose of literature review.

**3.8.2 Methodology for TISM**

The research constructs drawn from the conceptual review of literature have been further investigated through the Total Interpretive Structural Modeling (TISM) technique (Sushil, 2012). This qualitative modelling tool is an upgraded version of Interpretive Structural Modeling (ISM) proposed by (Warfield, 1973) that enables to develop a hierarchical structure of variables of interest. The Interpretive Structural Modeling (ISM) uses the graph theory notions in order to identify relationship among specific elements that define a problem and then develop a graph representation of the complex pattern of interrelationship between these set of elements. ISM is a process that transforms unclear and poorly articulated mental models of systems into visible, well-defined models useful for many purposes (Saxena et al., 2006). It is basically an interactive learning process. In this technique, a set of different directly and indirectly related elements are structured into a comprehensive systematic model. The resultant model then depicts the structure of a complex problem in a carefully designed pattern.

Total Interpretive Structural Modeling (TISM) builds upon ISM and is an innovative version of the same. The ISM technique provides a depiction of the linkage or relationship among the different components or variables of interest through diaphragms. This is a diagrammatic representation of the inter relationships. However, one of the limitation of this technique is that it depicts only the link or relationship between the variables, the interpretive logic behind this link is not depicted. The TISM technique fills in this gap by recording the logic or reason behind every link that is discovered between the variables.

In context of the present study wherein the different variables of study may bear a complex and close relationship, TISM technique is quite useful to add clarity and reveal the interrelationships. This methodology has been used to develop a hierarchical structure of the various antecedents of graduate employability in information technology sector.
3.8.3 Methodology for the Opinion Survey

The current study is an empirical research that aims to use empirical evidence and analyze them quantitatively to draw conclusions. This study uses opinion surveys as a scientific method of enquiry for the research. These surveys aims at validating the relationship between the research constructs and measure the perceptual difference among the two stakeholder groups i.e. employers and graduates in information technology sector on the skills that are considered crucial for jobs.

The surveys are undertaken in order to make statistical inferences about the population under consideration. To conduct these surveys, two separate sets of questionnaires have been formulated in order to collect data and capture the perceptions two key stakeholder groups- the fresher graduates from information technology courses seeking jobs and on the other hand, the employers operating in the Information Technology sector. The sample size for these opinion surveys has been calculated using Cochran’s formula and the minimum sample size requirements for applying statistical techniques that have been used in this study.

Statistical Package for Social Sciences (SPSS) is used for the statistical analysis of data. At the initial stage, Principal Component Factor Analysis has been used to validate the items of the constructs. In order to measure the reliability of the designed questionnaire, Cronbach Alpha has been used. Furthermore, Univariate Analysis has been used to analyze the descriptive statistics for all the macro and micro variables used for the study. As discussed previously in this section, hypotheses of association and hypotheses of difference have been formulated for further investigation. Correlation and Regression Analysis techniques has been used to test the hypotheses of association. One way Analysis of Variance (ANOVA) tests have been used to identify any significant difference in the perceptions of the two stakeholder groups i.e. graduates and employers. Figure 3.3 depicts the flow chart for statistical analysis.
3.8.4 Synthesis of Results for Assessment of Employability Gap through Perceptual Analysis

The correlation and regression results obtained from the two distinct opinion surveys for employers and graduates have been synthesized for perceptual analysis of these two stakeholder groups. A comparison of these results enables to clearly identify the areas of perceptual differences between these groups on the factors that are considered crucial for employability. Such an analysis has been done by comparing the values of correlation coefficient, coefficient of determination and the beta values obtained through regression results for each of macro and micro variables of study across the two groups. Further, the employability gap is assessed through the results of this perceptual analysis. The areas of differences in perception between the two stakeholder groups are identified that clearly highlights the reasons that contribute to widening the employability gap.
3.8.5 Methodology for Triangulation

Triangulation technique has been envisaged for this study. This technique basically refers to using multiple sources of data in order to gain a deeper understanding of a phenomenon. The effectiveness of triangulation rests on the premise that the weaknesses in each single method will be compensated by the counter-balancing strengths of another. It allows researchers to be more confident of their results (Jick, 1979). Triangulation incorporates different viewpoints and methods and therefore acts as a process of verification.

“In the social sciences, it refers to the combination of two or more theories, data sources, methods or investigators in one study of a single phenomenon to converge on a single construct, and can be employed in both quantitative (validation) and qualitative (inquiry) studies” (Yeasmin and Rahman, 2012).

Triangulation is a useful technique in verification of results and provide confirmation and completeness. It increases the validity and reliability of the research. It helps to achieve confirmation of findings through convergence of different perspectives. By combining multiple observers, theories, methods, and empirical materials, researchers can hope to overcome the weakness or intrinsic biases and the problems that come from single method, single-observer, single-theory studies.

Denzin (1978) identified four basic types of triangulation: Data triangulation; Investigator triangulation, Theory Triangulation and Methodological triangulation. In context of the present study, multiple triangulation techniques have been used. Data triangulation has been used to cross validate the results obtained from the two groups of respondents i.e. employers and graduates. Also, methodological triangulation has been used to examine the congruence of results obtained from the qualitative and quantitative analysis techniques. The outcomes of triangulation have further endorsed the obtained results of this research.

Further, the conclusions for the study are drawn and recommendations have been proposed.
3.9 RESEARCH ANALYSIS TECHNIQUES

The study follows a logical and methodical approach for execution. The same is depicted in the flowchart in Figure 3.4

![Flowchart for Research Approach](image-url)
In order to portray the logical approach for the execution of this research, the complete methodology designed for this research is depicted in the form of a flowchart in Figure 3.4. The research model has been conceived from the extensive review of literature. Further, the relationships between the different variables of study have been delineated using TISM technique. To establish the validity of the obtained model, expert surveys have been conducted that further add to the credibility of the obtained results. Data has been methodically collected through two separately designed questionnaires to capture and compare the perceptions of two stakeholder groups. Further, the data is analyzed using suitable statistical techniques to reveal the perceptual differences. Also, the proposed empirical model has been conceptually validated using multivariate data analysis techniques. The results so obtained from the two opinion surveys have been synthesized for the perceptual analysis of the two stakeholder groups and further attributing the reasons for employability gap based on the same. Also, the obtained results have been triangulated using data triangulation and methodological triangulation techniques validation and completeness. Further, logical conclusions have been drawn from the findings and recommendations have been proposed.

The research methods and sampling techniques are summarized in Table 3.6

<table>
<thead>
<tr>
<th>Study Phase</th>
<th>Objective of the Study</th>
<th>Research Method Used</th>
<th>Sampling Technique Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>TISM</td>
<td>To understand the hierarchical relationships among identified variables</td>
<td>Personal Interviews and survey with the domain experts</td>
<td>Judgmental sampling</td>
</tr>
<tr>
<td>Opinion Survey</td>
<td>To validate the relationships proposed in research model and understand the perceptual differences between two stakeholder groups</td>
<td>Questionnaire based survey method</td>
<td>Judgmental / Convenience/ Snowball sampling (survey-I)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Judgmental / Convenience sampling (survey-II)</td>
</tr>
</tbody>
</table>

Table 3.7 portrays the research analysis techniques that have been used for this study.
### Table 3.7: Description of Research Analysis Techniques Used

<table>
<thead>
<tr>
<th>Research Analysis Techniques</th>
<th>Objective of the Analysis</th>
<th>Author(s) Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISM and TISM</td>
<td>ISM and TISM has been used to analyze and interpret the relationships among the identified research variables and develop a hierarchical structural model</td>
<td>Warfield, 1973, Sushil, 2012</td>
</tr>
<tr>
<td>Factor Analysis</td>
<td>To describe variability among correlated variables and reduce the number of variables</td>
<td>DeCoster, 1998; Brown, 2015</td>
</tr>
<tr>
<td>Univariate Analysis</td>
<td>To describe the basic features of macro and micro variables in terms of mean, median, standard deviation</td>
<td>Ostle, 1963, Huberty and Morris, 1989</td>
</tr>
<tr>
<td>Correlation Analysis</td>
<td>To measure the linear association between macro and micro constructs of study</td>
<td>Ezekiel and Fox, 1959; Cohen et al., 2013</td>
</tr>
<tr>
<td>Regression Analysis</td>
<td>To test if the independent variables of study act as a predictor of the dependent variable.</td>
<td>Ezekiel and Fox, 1959; Cohen et al., 2013</td>
</tr>
<tr>
<td>One way ANOVA</td>
<td>To determine the existence of significant differences between the perceptions of two stakeholder groups</td>
<td>González-Rodríguez and Gil, 2012; Scheffé, 1999</td>
</tr>
</tbody>
</table>

### 3.10 CHAPTER SUMMARY

This chapter highlights the research design and methodology and approach that has been adopted for the present study. To elucidate the same, it describes the phases of strategic assessment, research variables, conceptual research model, the hypotheses that have been formulated and the research methods that have been used. The following chapters elaborate the step wise implementation of the research methodology in detail.