CHAPTER 2

REVIEW OF LITERATURE

This section explores and analyses the theoretical background of the ERP adoption in SMEs. Initially, the literatures that broadly discuss on the adoption of various technologies among the SMEs have been collected and the various theories are compared. This will lead to a possible identification of a gap in the existing literature and direct towards a framework for the study. A conceptual model is systematically developed that will possibly address the literature gap. Relevant literatures on the narrow area of the concepts taken for research and how they are related are discussed during the model development. Propositions are then arrived at from the conceptual model and the hypotheses are developed.

2.1 RESEARCH FOCUS ON SME

SMEs are the backbone of the nation’s economy for any country and particularly in developing countries. However, SMEs do not have necessary technical capacity. This deficiency makes SMEs an ideal market for technological upgradation. Therefore, what these SMEs primarily need today is the access to new technology. Despite its commendable contribution to the nation's economy, SME sector does not get the required support from the concerned government departments, banking sector, financial institutions and corporate sector. These handicaps prevent it from becoming more competitive at the national and international markets and therefore demand an immediate and proper redressal. SME sector faces a number of problems
like limited knowledge, non-availability of suitable technology, low production capacity, ineffective marketing and identification of new markets, constraints on modernisation and expansions, non-availability of highly skilled labour at affordable cost and follow up with various agencies in solving regular activities. These factors obstruct the SMEs in surging ahead (‘Challenges to SME sector’ n.d.).

India has nearly three million SMEs, which account for almost 90% of the total enterprises, 50% of the industrial output and 42% of India’s total exports. Indian SMEs have unique characteristics. They are born out of individual initiatives and skills and provide greater operational flexibility because of their size. They have a low cost of production and labour intensive that provides high employment orientation. They utilize the locally available human and material resources and reduce the regional imbalances. The Indian SMEs have high propensity to adopt new technology and capacity to innovate and export. However, SMEs are passing through a transitional period because of the globalization and liberalization along with the enhanced competition from the neighbouring countries. The SMEs in India still wade in technological backwaters vis-a-vis advances in science and technology (Ministry of MSME, GoI 2010).

Despite the fact that ERP implementation in large corporations is nearing saturation, study on ERP adoption in SMB still requires attention. This is justified by IDC’s survey, which found that the awareness of ERP among SMB is, less than 35% compared to more than 80% in large organisations. With this kind of awareness level, adoption of ERP in SMB is even lesser. The issues of SMB’s are different from the large organisations and the motives that drive ERP adoption are unique and need to be understood independently for a better penetration of ERP system.
Ramdani and Kawalek (2007) noted that the attention of software vendors has moved recently to SMEs, offering them a vast range of enterprise systems, which were formerly adopted by large firms only. IT innovations are highly differentiated technologies for which a single adoption model is not adequate. Additionally, the question why one SME adopts an enterprise system while another does not, has yet to be explored. Contrary to large companies that are mainly affected by organisational factors, this study shows that SMEs are not only affected by environmental factors as previously established, but also by technological and organisational factors.

2.2 DECISION-MAKING FRAMEWORKS IN ERP ADOPTION

Jeyaraj et al. (2004) quoted that IT adoption and diffusion have received extensive attention in prior research. Adoption generally refers to an individual or organisation’s decision to either adopt or reject an innovation. Diffusion refers to the process by which innovations spread to individuals within an organisation or organisations within a population over a time (Rogers 1995). They examined 45 empirical studies on individual IT adoption and 44 studies on organisational IT adoption published between 1992 and 2003. They found eight classes of dependent variables (perceived systems use, intention to use, adoption, diffusion, rate of adoption, outcomes, actual system use and time of adoption) and four classes of independent variables (organisational, innovation, individual and environmental characteristics).

Dwivedi et al. (2008) profiled the adoption, acceptance and diffusion research in the IS discipline. They consolidated nearly 56 theories
found in 345 articles on IS adoption, acceptance and diffusion. They found out that the Technology Acceptance Model (TAM), Diffusion of Innovations (DoI), Theory of Planned Behaviour (TPB), and Theory of Reasoned Action (TRA) are frequently used theories and among which TAM is the popular framework that is mostly used (29.2%) in studies that were examined. However, these studies were spread over 292 different technologies and at different unit/level of analysis. Similar to other technologies, many researchers have provided frameworks and insights that tried to explain the adoption of different information systems including ERP.

2.3 ERP ADOPTION - UNIT OF ANALYSIS

ERP adoption can be analysed from two levels, organisational and individual. This may be identified at two different stages of the ERP lifecycle. Researchers have described ERP lifecycle with models having three to six stages. Rajagopal (2002) framed ERP implementations in terms of the six-stage model of IT implementation consisting of initiation, adoption, adaptation, acceptance, routinisation and infusion (Somers and Nelson 2004). A similar framework is proposed by Esteves and Pastor (2001). This framework was structured in phases, which consist of the several stages that an ERP system goes through during its whole life within the hosting organisation. The stages were adoption decision, acquisition, implementation, use and maintenance, evolution and retirement phase.

Lopez and Esteves (2010) quoted Moore and Benbasat (1991) and Jeyaraj et al. (2006) in their study for identifying various theories used in individual / organisational IT adoption research (Table 2.1).
Table 2.1 Theories used in individual and organisational IT adoption research

<table>
<thead>
<tr>
<th>Theory</th>
<th>Main Author(s)</th>
<th>Used in individual adoption studies</th>
<th>Used in organisational adoption studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Characteristics of Innovations</td>
<td>Moore and Benbasat (1991)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Social Cognitive Theory</td>
<td>Bandura (1986)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Technology Acceptance Model</td>
<td>Davis (1989)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Technology Acceptance Model II</td>
<td>Venkatesh et al. (2003)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Theory of Reasoned Action</td>
<td>Fishbein and Ajzen (1975)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Diffusion/Implementation Model</td>
<td>Kwon and Zmud (1987)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Tri-Core Model</td>
<td>Swanson (1994)</td>
<td></td>
<td>X</td>
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</table>

Source: Lopez and Esteves (2010)

The organisational level of ERP adoption research focuses on the early stages of the lifecycle. This can be identified as the initiation and Adoption Stage of Rajagopal’s (2002) framework and the Decision Stage of Esteves and Pastor’s (2001) framework. This phase is the one in which managers, while selecting the general IS, must question the need for a new ERP system that will best address the critical business challenges and improves the organisational strategy. This decision phase includes the
definition of system requirements, its goals and benefits, and an analysis of the impact of adoption at the business and organisational level.

Individual level of ERP adoption research focuses on the mid stage of ERP lifecycle that can be identified as the Acceptance Stage in Rajagopal’s (2002) framework or with the Use and Maintenance Stage of Esteves and Pastor’s (2001) framework. This phase consists of the use of the product in a way that returns expected benefits and minimizes disruption. During this phase, one must be aware of the aspects related to functionality, usability and adequacy to the organisational and business processes. Once a system is implemented, it must be maintained, because malfunctions have to be corrected, special optimization requests have to be met and general systems improvements have to be made.

Uzoka et al. (2008) tried to explain the organisational ERP adoption using TAM, based on perceived usefulness and perceived ease of use that is moderated by IS success constructs of DeLone and McLean model in which the behavioural intention is explained as the choice of ERP from different products. Kerimoglu et al. (2008) modelled the user satisfaction leading to organisational adoption. Kerimoglu and Basoglu (2005) included project communication and training as influences in organisational adoption. Other researchers have used ERP adoption at the individual level in terms of user acceptance (Amoako-Gyampah and Salam 2004; Calisir and Calisir 2004; Bueno and Salmeron 2008; Sun et al. 2009; Ya-Yueh Shih 2006; Calisir et al. 2009).

TAM is usually used to explain how users come to accept and use technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when
they will use it, notably factors such as perceived usefulness and perceived ease of use. To compete with other user acceptance models, Venkatesh et al. (2003) formulated the Unified Theory of Acceptance and Use of Technology (UTAUT) that consolidated the constructs of TRA, TAM, Motivational Model, TPB, Model of Personal Computer Utilization, DoI Theory and Social Cognitive Theory. This model was found to outperform (Adjusted R square of 69%) each of the individual models (Venkatesh et al. 2003). Amoako-Gyampah and Salam (2004) extended TAM in an ERP implementation. Many researchers followed and extended the model further with additional factors. Going by Moon and Kim (2001), the constructs of TAM were extended by incorporating additional factors such as computer self-efficacy (Shih 2006); TRA and DoI (Calisir et al. 2009); constructs of DeLone and McLean IS success model (Uzoka et al. 2008).

In opposition to the popularity of TAM, there are also some critics. Journal of Association for Information Systems in April 2007 carried a special issue “Quo Vadis TAM - Issues and Reflections on Technology Acceptance Research”. In this issue, Bagozzi (2007) argued that TAM is conceived largely as a framework for explaining decision making by individual persons. He quoted Venkatesh et al. (2003) that the “basic concept underlying user acceptance models” is that decisions and usage are initiated by “individual reactions to using information technology”. He also examined the “social influence processes” that was introduced into TAM and argued that it has a limited sense as “opinion of people important to the decision maker or as an attempt to enhance his status in a social system, such as a reference group”. He was apprehensive that technology acceptance research has not considered group, cultural or social aspects of decision-making and the usage very much. As ERP is a multi user product cutting across departments and requires many people in purchase decision, TAM can be
considered as more appropriate at individual/end user level rather than organisational level in adoption decision. In addition, Nzaou et al. (2008) explained that the research into adoption of ERP can be identified on Esteves and Pastor’s (2001) six-stage model that includes two adoption stages, one at the organisational level during Initiation stage and another at the individual level during adaptation stage.

Jeyaraj et al. (2004) studied the significance of the variables used in organisational adoption and individual adoption. They found that studies on individual adoption that also included the organisational independent variables were found to be significant. This has particular implications for TAM research, which tends to neglect organisational factors. Therefore, TAM can be considered suitable at the adaptation stage in ERP lifecycle stage.

The next popular adoption theory used in research is DoI (Rogers 1962). DoI process is a type of decision-making, which occurs through five stages namely knowledge, persuasion, decision, implementation and confirmation. Rogers also defined several intrinsic characteristics of innovations that influence an individual’s decision to adopt or reject an innovation based on relative advantage, compatibility, complexity trialability and observability. Rogers defined adopter category based on the time when an individual adopts innovation as an innovator, early adopter, early majority, late majority and laggard.

A variant to technology diffusion model is proposed by Geroski (2000). The adoption of new technology goes beyond the individual intention and will be influenced by certain other factors. The author proposed four different models. Epidemic model includes the lack of
information available about the new technology that limits the speed of adoption. Probit model looks at different firms with different goals and abilities that are likely to adopt the new technology at different times. Legitimation and competition model considers dependence on environment. Finally, ‘Herd Behaviour’ model proposed that the initial choice between different variants of the new technology affect the subsequent diffusion speed of the chosen technology.

Similar to TAM, DoI is also used at individual and organisational levels. The adoption of innovative technology by organisations is done through two types of innovation-decisions namely collective decision and authority decision. The collective-innovation decision occurs when the adoption of an innovation has been made by a consensus among the members of an organisation. The authority-innovation decision occurs when the adoption of an innovation has been made by very few individuals with high positions of power within an organisation (Rogers 2005).

In addition to innovation characteristics and adopter’s characteristics, Rogers (2005) stated that the adoption decision will be influenced by the consequences of both positive and negative outcomes when an individual or organisation chooses to adopt a particular innovation. Rogers listed three categories for consequences: desirable vs. undesirable, direct vs. indirect and anticipated vs. unanticipated. Wejnert (2002) noted that adoption processes are different for individual persons and for collective entities within which individuals operate. Taking care of these distinctions, she adds a few more categories for consequences: public vs. private and benefits vs. costs. Public consequences refer to the impact of an innovation on those other than the actor, while private consequences refer to the impact
on the actor itself. The benefits of an innovation obviously refer to the positive consequences, while the costs refer to the negative.

Hung et al. (2004) used the DoI for ERP adoption and made a discriminant analysis between adopters and non-adopters on factors such as Chief Executive Officer’s (CEO) characteristics, organisational characteristics (Complexity), environmental characteristics (Pressure) and ERP characteristics.

Ramdani and Kawalek (2007) who reviewed and made assessment of previous research on SME’s IS adoption, quoted that Rogers is a prominent advocate of DoI model. They described the innovation-decision process as “the process through which an individual or other decision making unit passes from knowledge of an innovation, to forming an attitude towards the innovation, to a decision to adopt or reject, to implementation of the new idea and to confirmation of this decision”. DoI model helps in scanning the organisational problems / opportunities and the IT solution faced across the six phases of IS implementation by Cooper and Zmud (1990). The outcome of this exercise is that it helps at the Initiation stage in finding a match between IT solution and its application in the organisation. In fact, during the Adoption stage, the organisational backing for the implementation of the IT application is arrived, and the outcome of this stage is the decision to invest resources necessary to accommodate the implementation effort. These statements clearly state that in the organisational adoption, DoI is more applicable during the Initiation stage, when the awareness of the innovation technology is created.

It is also understood that the studies using TAM and DoI for ERP adoption have not considered the influence of economic and institutional...
factors. It is known that SMEs face inherent economic challenge because of their size and the institutional isomorphic pressures because of their dependence in the supply chain.

One model that utilizes the influence of cost-benefit consequences in innovation diffusion is the Rapid Economic justification model (REJ) for larger projects developed by Microsoft. This model is used to justify the software purchase. REJ was developed after the accelerated activity caused by Y2K fears and the financial environment by economic recessions. Even with the bursting of the technology bubble, companies started demanding better accountability for their software purchases and REJ framework provides a structured approach that helps IT managers’ link information technology investment decisions to business issues which are important to their organisation. REJ has been validated by independent authorities such as KPMG Consulting Group and Gartner Group.

Microsoft’s REJ is a systematic process for quantifying the value of IT. The process starts with a team of business people identifying the company’s critical success factors and key performance indicators, and agreeing to how they will measure progress. The group then determines the technology that addresses these factors, estimates the benefits and costs, assesses the risks and presents the investment in terms of the company’s preferred metrics.

Chen (2001) described that adoption of ERP represents a substantial investment for the firm which ranges from a few million for a small company to over a billion for a large firm. The huge investment required to implement an ERP system needs to be weighed carefully against the eventual saving and benefits that the system will produce. Many large
ERP systems proceed without sufficient analysis of cost and benefits. The cost of an ERP implementation is generally quantifiable, though the biggest opportunity costs for some firms can be the cost of not investing in an ERP system. Unlike the costs, many benefits are often difficult to quantify. Hybrid justification strategies (combination of economic and strategic justification) for an ERP project prior to installation are necessary not only because of the enormous investment and risks involved, but also because of the justification process which helps to identify all the potential benefits that can be accrued. The ERP implementation also becomes a yardstick for performance evaluation at the later stage.

However, both REJ and hybrid justification models lack in describing the influence of institutional isomorphic pressures that have the potential to moderate the justification of investment in ERP adoption.

Tornatzky and Fleisher (1990) proposed a Technological, Organisational and Environmental (TOE) model that explains the process by which a firm adopts and implements the technological innovations. The technological context includes the internal and external technologies that are relevant to the firm. Technologies may include both equipment as well as processes. The organisational context refers to the characteristics and resources of the firm, including the firm’s size, degree of centralisation, degree of formalisation, managerial structure, human resources, amount of slack resources and linkages among employees. The environmental context includes the size and structure of the industry, the firm’s competitors, the macroeconomic context and the regulatory environment.

TOE framework has also been claimed to be a generic theory of technology adoption/diffusion (Zhu et al. 2003) that can be used to study
SMEs’ willingness to adopt ERP. Ramdani and Kawalek (2008) proposed a method to predict SME’s willingness to adopt ERP, CRM, Supply Chain Management (SCM) and E-Procurement Systems using the TOE framework.

Nzaou et al. (2008) developed a positivist case study based on the Boudreau and Robey (1999) multidimensional framework for adoption of ERP systems. The framework addresses ERP Adoption implementation as a 3D process (form of the change, motor of change and theory). The theoretical content dimension of this model allows for the inclusion of theories, namely, the DoI and Neo-institutional and complexity theories. These theories are borrowed from Rogers (1962), DiMaggio and Powell (1983) and Anderson (1999). A few studies on the institutional isomorphism in ERP adoption were done by Benders et al. (2006) that included technical pressure with isomorphic pressure on organisational adoption and the mediating role of top management in user adoption by Liang et al. (2007).

Complex organisations exhibit surprising, nonlinear behaviour. The strategic direction of complex organisations consists of establishing and modifying environments within which effective, improvised, self-organised solutions can evolve. Managers influence strategic behaviour by altering the fitness landscape for local agents and reconfiguring the organisational architecture within which agents adapt. Buonanno et al. (2005) studied the effect of organisational complexity, in ERP adoption.

Jeyaraj et al. (2004), critically evaluated that individual adoption studies did not examine environmental factors. Studies on organisational adoption systematically found out that organisation and innovation variables to be more frequently significant than the other independent variables. Though under-studied, environmental factors also showed a promising effect
on organisational adoption. However, none of the organisational adoption studies included individual level independent variables. Some of the other models used in the organisational adoption of ERP are benefits, barrier and risk framework (Kamhawi 2008); Cost Benefit Model (Shiau et al. 2009); Strategy, Technology, Organisational, People and Environment (STOPE) (Oliver et al. 2005); IT/IS Justification (Gunasekaran et al. 2006); Discrete Choice Analysis (DCA) (Keating et al 2009).

2.4 ERP ADOPTION IN SME

Attewell (1992) explained that most of the diffusion research in IS confirm to one of the two distinctive styles: adopter studies and macro diffusion studies. The first one looks at the differences in adopter innovativeness, whereas the second deals with characterising the rate and pattern of technology adoption among the potential adopters. The ERP adoption study for SME is of the second referred type in which the pattern of the ERP adoption is specifically studied among the SMEs.

Rahim et al. (2010) introduced a notion of organisational motivation for IS adoption. They argued that organisational motives for IS adoption is an important notion that needs to be conceptualized differently for different types of IS. However, Cereola (2008) quoted that there is little research work published on IS adoption by SMEs and its significance is highlighted by Bernroider and Tang (2003). They suggested that research with a focus on the early stages of adoption decision making is necessary. This will help in evaluating and selecting an ERP system prior to implementation in small to medium sized enterprises. Their study attempted to link the results of the early stages of decision making to implementation, usage and evolution success. This will allow important conclusions to be
made on the best practices in decision-making or decision quality and success.

Raymond and Uwizeyemungu (2007) and Ramdani et al. (2009) validated the profile of manufacturing small to medium-sized enterprises with regard to their adoption of an ERP system, based on the predisposition of their TOE framework developed by Tornatzky and Fleischer (1990). This framework has also been claimed to be a generic theory of technology adoption/diffusion (Zhu et al. 2003), that can be used to study SMEs’ adoption of ES (Ramdani and Kawalek 2007). Rogers’ (2005) innovation diffusion theory for organisations is used as a theoretical basis for studying the impact of technological factors on SMEs’ adoption of ES. Top management support, organisational readiness, IS experience and organisational size are used as organisational factors. Industry, market scope, competitive pressure and external IS support are used as measures of environmental influence.

Shiau et al. (2009) developed a measure to assess the ERP adoption in SMEs. In this study, they focus on the investment decisions, benefit analysis, cost analysis and technology analysis related to the adoption decision of ERP systems. They found that the dimensions affecting ERP adoption show that the characteristics of CEO and perceived benefits possess positive effects on ERP adoption, while cost and technology have negative effects on ERP adoption. However, only “perceived benefits” is a significant dimension. It is surprising that the cost of the ERP system does not significantly affect ERP adoption. There are a few recent studies focusing on adoption of cloud computing and Software as a Service (SaaS) model of ERP in the SME segment (Danaiata and Hurbean 2010; Kate Evans-Correia 2007; Sharma et al. 2010).
Rahim et al. (2010) drawing upon two different studies, framed a taxonomy of motives for business intelligence systems adoption. This model has two main categories of motives, Techno-Economic and Socio-Political motivation. Under the Techno-Economic motivation, they have included the expected benefits and problems. Within the Socio-Political motivation, they again sub-categorize it into Institutional and Psycho-Sociological. The institutional motives are professional norms, external pressure and organisational culture. Psycho-Sociological factors include personal factors.

From the review of literature, it is understood that there is no model that illustrates the ERP adoption in the context of the decision-making characteristics of the SME, whose decision is bound to be influenced by the interaction of both external and internal factors. This study tries to develop an ERP adoption model for SME’s that illustrates the interaction among the institutional theory, complexity theory, and the cost-benefit analysis.

2.5 DEVELOPING A CONCEPTUAL MODEL FOR ERP ADOPTION

Motives are the driving force produced by the pressure of needs and wants. The decision to fulfil the goals or needs is moderated by the benefits and the risk associated with the acquisition of a product, which is often evaluated from the knowledge of previous learning or cognitive process (Figure 2.1).
Developing on this fundamental motivation process of Durgee et al. (1996), it is proposed that the driving force in ERP adoption can be identified as the institutional isomorphic pressures. The decision to adopt ERP is affected by the evaluation of the benefits and challenges, and organisational complexity that creates a need for the product. To get a further insight and the real factors behind this phenomenon, a few experts in the industry and academia were interviewed. The relevance of the study and its practicability is understood by involving people in the industry. A review is made on the literatures identified on the refined areas. Like zooming of a picture, the problem under study is identified within the context and is narrowed down to its immediate influencing factors. The literatures are further referred to elaborate within the narrow area. The initial part of this chapter described the various streams of research and the degree of knowledge available on the topic. The broad domain area is narrowed down to the concepts that can possibly answer the research question.
2.5.1 Construct Analysis

Within the narrow research area, the concept is broken down into its units or dimensions, termed as constructs that build the concepts. Each construct is marked on a sticky note. The sticky note is arranged and rearranged to make a logical connection. Their relationships as understood from the literatures are also represented. At this stage, the experience of the researcher and the suggestions got from the experts are extended into a model.

2.5.2 Developing an Initial Model

Holton and Lowe proposed to develop an initial theory at this stage using the Dubin’s (1978) theory building method that pronounced the components of the theory. The components of the theory are translated into that of a model and thus an initial model is developed. The complexity of the world’s scientific knowledge is made up of concepts. Concepts have a basic association in a particular instance and one can assume and infer a new instance by these associations. A construct is the concept that is common among observed phenomena. Dubin employed a neutral term ‘units’ to designate the things out of which theories are built. To identify these units, the theorist begins understanding which of the constructs from the construct analysis influences the outcome. The units are interchangeably called dimensions/constructs/variables and are represented by a rectangle or an ellipse. The following units are identified for the study: (1) Institutional isomorphic pressures in ERP adoption (2) Perceived Benefits (3) Perceived Challenges (4) Organisational Complexity and (5) ERP Adoption (Figure 2.2).
2.5.2.1 Concept 1 - Institutional isomorphic pressures in ERP adoption

Clusters have been the interest of research, and policy makers after Porter (1990) popularized the concept. Before Porter, it was studied as the concept of localization of industries as termed by Marshall in 1920. A cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementaries. The geographic scope of a cluster can range from a single city or state to a country or even a network of neighbouring countries (Porter 1998). The relationship between the firm and the cluster is mutual. A cluster is defined and shaped by the contributions of the individual firm and the individual firm benefits by being a part of the cluster. A cluster obtains its
competitive advantage primarily by its geographical proximity, which helps the entire value system to coordinate better and provide more value. In addition, collective innovation, improvement, and changes are seen to be the major factor in creating the competitive advantage. Clusters are recognized for their productivity and innovation as compared to their counterparts outside the cluster.

Arthur (1990) noted that a cluster would have the knowledge spill over, that leads to a collective innovation arising from everyday contact and networking through geographical proximity, as well as from the formal arrangements such as joint ventures and joint research work with universities. This close relationship between the firm and others in the organizational environments within a cluster can be understood beyond the task environment of a mere resource sharing to a close interdependence leading to an influence that shapes and sometimes controls the behaviour of the firm. Meyer and Rowan (1977) and DiMaggio and Powell (1983) in their institutional theories proposed that isomorphism is the master bridging process within the cluster that makes organisations homogenous and more similar in structure over a period of time. DiMaggio and Powell highlighted the influence as the social forces that lead to the copying of innovative practices among the firms and move towards an institutional isomorphism. They identify three general mechanisms of isomorphism: (i) Coercive isomorphism in which an organisation is compelled to adopt structures or rules; (ii) Mimetic isomorphism in which organisations tend to imitate other successful organisations, when they are faced with uncertainty and ambiguity; and (iii) Normative isomorphism occurs when the organisation adopts certain reforms because of professional pressure. The similarities caused by these three processes allow firms to interact with each other more easily and to build legitimacy among organisations.
Today's globalised and competitive environment puts up pressure on organisations for greater levels of organisational integration and the need for IS. Likewise present day customers increasingly expect products to fit their specific needs, and a faster delivery. This requires a tight link in the supply chain. Further, the firms are concentrating more on core competencies by sub-contracting or outsourcing other parts of their operations, which also require a sharp relationship between their business processes. Moreover, increasing numbers of strategic alliances between business partners such as just-in-time inventories require that operational processes of otherwise independent firms be coordinated. Finally, increased reliance on e-commerce business models requires technological infrastructures, and the integration of an organisation's processes with that of suppliers of products and services, as well as with those of their distributors. These factors produce a state of need for enterprise solutions. Institutional forces retain their influence throughout the life cycle of complex enterprise systems from the adoption stage and then evolve continuously. The external institutional forces also influence ERP assimilation within an organisation (Armstrong and Sambamurthy 1999; Liang et al. 2007).

Benders et al. (2006) and Liang et al. (2007) have applied institutional theory to explain a firm’s adoption of ERP system. Benders et al. introduced a novel form of isomorphism, called technical isomorphism. They illustrate how coercive and technical isomorphism jointly leads to adaptation of the organisation to the ERP system, although the firm aimed at differentiating from its competitors. Liang et al. found that coercive, mimetic and normative pressures directly influence the ERP assimilation but differently moderated by the top management. The institutional sociology framework emphasizes the importance of regulatory, normative and cognitive factors that affect firm’s decisions to adopt a specific
organisational practice beyond the technical efficiency of the practice. Following Teo et al. (2003) and Liang et al. the institutional isomorphic pressures are measured by the three dimensions as below:

   **a) Coercive pressures:** Coercive pressures are based on the enforced rules from exogenous providers or authorities of resources. Rules, requirements and regulatory forces will be coded under the label coercive isomorphism. The likely sources are governmental agencies, venture capitalists and banks.

   Coercive pressures have been shown to be significant in the adoption of innovations. Teo et al. in their Electronic Data Interchange (EDI) study found out that coercive pressures mainly stem from dominant suppliers and customers because of the nature of EDI as a dyadic technology linking business partners. In developing countries, government agencies still exert significant influences on business policies and practices in addition to the emerging market forces. For example, pharmaceutical companies have direct pressures from the government agencies that require specific report formats or standard procedures supported by certain ERP modules. Government mandates specific accounting report formats supported by the accounting modules of ERP (Xue et al. 2005).

   Coercive pressures are measured by three sub-constructs, namely, perceived dominance of supplier adopters, perceived dominance of customer adopters, and conformity with parent corporation’s practices. Perceived dominance of supplier adopters was measured by asking respondents to indicate whether their organisation's well-being depended on these suppliers, whether they could switch to alternative suppliers, whether it was critical to maintain good relationships with these suppliers and whether these suppliers
represent the core suppliers in their industry. Questions used to measure perceived dominance of supplier adopters were also used to measure perceived dominance of customers by simply replacing supplier with customer. Conformity with the parent corporation’s practices was measured by indicating whether the parent corporation had adopted ERP. Organisations are likely to face greater conformity pressures when their parent corporations have adopted ERP.

**b) Mimetic pressure:** Mimetic pressures are based on modelling after successful peers. Such activity reduces uncertainty. Business plans among successful competitors, collaborators and organisations, towards which the organisation has strong ties, will be coded as mimetic pressures. In ERP assimilation, top management mediates the effect of mimetic pressures, when it sees that other firms have implemented ERP and obtained competitive advantage. During uncertainty of the outcomes of ERP initiatives, top managers mimic the actions of their successful peers or competitors, since it shields them against potential loss of face and helps to maintain the legitimacy of their decisions.

The mimetic pressures are measured by two sub-constructs: the extent of adoption by competitors and the perceived success of adoption by competitors. The latter sub-construct was measured on the feedback received from the respondents as to the extent to which their competitors adopted ERP and benefited greatly, and to what extent it had been perceived favourably by others in their industry, supplier industry and customer industry.

**c) Normative pressure:** Normative pressures are the result of customary professional and socially accepted and responsible discourses.
Expressed support for business plans among actors in the firms’ environment will be coded here. Likely sources are professional consulting firms, management literature, and educational influence.

The role of normative pressures in ERP assimilation processes is closely related to the key characteristic of ERP systems believed to maintain best practices for the industry. Members of an organisational field such as suppliers, customers, consultants, and governments collectively evaluate and promote various features of the product. Normative pressures usually permeate through the networking of the top managers with suppliers and customers, channels of professional affiliations, as well as the increasingly popular ERP user conferences hosted by vendors.

Normative pressures could arise from the members of dyadic relational channels and multilateral organisations such as professional, trade and industry organisations. Hence, as argued for the cases of mimetic and coercive constructs, normative pressures construct is operationalised as a formative, emergent construct formed by three sub-constructs: the extent of adoption by an organisation’s suppliers and customers, and participation in professional, trade and business bodies (Member).

Li Chao and Wang Xiaofei (2009) studied the role of isomorphism in the high-tech enterprise cluster of software industry in Zhongguancun, China. They put forth the institutional theory from the view of sociology of an organisation and take the “Organisational Field” to explain the mechanism of isomorphism in enterprise cluster innovation, including coercive, mimic and normative isomorphism. They found that the innovative community in the organisational field makes enterprises in the
cluster more and more homogeneous in innovation, and ultimately drives the escalation of high-tech parks.

Gabbay et al. (2001) argued that the industrial cluster has both social and geographic features. They find that the meaning of an “industrial cluster” is extended to provide a “facilitating proximity” and the firms will be capable of adopting relevant business attitudes. They argued that the purpose of this adoption is twofold that can be assumed from the institutional theory. The first is obtaining a “mental model” which serves as a corporate “steering mechanism” under uncertainty. The second is achieving legitimacy among other significant players in the “industrial cluster”. Strand and Meyer (1994) studied the role of isomorphism in diffusion of innovation and suggested that institutional conditions operating in wider social systems affect the rate and form of diffusion. Rusten and Bryson (2007) supported that the adoption of an ICT system by a firm, or by the supply chain or even by a cluster of firms may represent a form of DiMaggio and Powell’s (1983) isomorphism in which firms are encouraged to copy the behaviour of others. A firm, because of all the three types of isomorphism, may adopt ICT. In a supply chain, ICT adoption may be the result of coercion, as the firm may have to adopt a common ICT platform. In this case, the dominant firm determines the ICT investment decisions of other firms involved in the supply chain. Rusten and Bryson argued that the role of ICT in contributing to the factors, that have been identified, as being important for the foundation and functioning of the industrial clusters. The discussion also explores the wider role that ICT plays within a cluster. It is a common misconception that ICT implies the end of geography or the importance of space as it has the ability to overcome the constraints imposed by distance (Cairncross 1997). Clustered firms may have different adoption experiences compared to firms located in other geographical settings.
In a similar concept, innovative technologies such as ERP is diffused by isomorphic pressure that drives a stronger urge of homogenization of managerial practices embedded in ERP systems as “best practice” standards. Caldas and Wood (1999) found evidence for a number of different types of isomorphic forces. They found that primary diffusion agents such as vendors, consultants and secondary diffusion agents such as media, management gurus, business schools and training agents produce a combined influence and generate a strong isomorphic pressure that pushes each organisation to comply with institutionalized management practices. Teo et al. (2003) used institutional theory as a lens to understand the factors that enable the adoption of inter-organisational systems. They found that all the three institutional isomorphic pressures - mimetic, coercive and normative pressures significantly influenced the adoption intention. This study recommends the application of institutional theory within Rogers’ (1995) framework to build a predictive model for adoption of information technologies.

Benders et al. (2006) studied on how and to what extent homogenization coincides with the deployment of ERP-systems. Using the work of DiMaggio and Powell (1983) on isomorphic pressures, they argued that the use of ERP systems may in several ways, lead to standardization within and between the organisations. Competitive and institutional pressures play a role in ERP-adoption. They also introduced a novel form of isomorphism called technical isomorphism. This plays a role in ERP implementation and manifests itself in the enactment of blueprints for centralization and standard working procedures that are embedded in the ERP-software. Liang et al. (2007) explained how the institutional theory that forces the organisation to adopt ERP is mediated by the top management and encourages assimilation in the post - implementation stage. They identify
that coercive pressure and mimetic pressure exert much influence on the top management, which affect the degree of ERP usage. They find that the normative pressure is not mediated by the top management participation, but has a direct influence on ERP usage. They conclude that the institutional isomorphism is not only important for adoption and implementation, but also contribute to the post implementation assimilation. Similarly, Baptista et al. (2010) studied the positive impacts of the institutionalisation of IT in both adoption and assimilation.

Nzaou et al. (2008) discussed applicable theories for ERP adoption specifically by SMEs. They argued that SMEs differ from the large firms in the adoption of new technologies because of their own characteristics and their dependence in the supply chain. They proposed a three dimensional framework for ERP adoption that include the institutional theory, DoI theory, complexity theory in one dimension and form of change and motor of change in the other dimensions.

As opposed to the technological reductionism in the ERP diffusion, Caldas and Wood (2000) revealed that an ensemble of substantive, political and institutional factors influenced the rationality in the decision process for ERP adoption. Substantive factors include all reasons for which ERP system will provide adequate and effective support imperatives and opportunities and solution to problems of the organisation. Institutional factors include external forces in the organisational environment, which pressurize ERP adoption such as the need for following trends, media influences and pressure from business partners. Internal politics, pressure of IT functions and head office are termed as political pressure.
Hung et al. (2004) and Pan and Jang (2008) identified the pressure as the environmental characteristics of the enterprise and included the competitive pressure and regulatory policies as one of the critical factors to the adoption of ERP. Aberdeen Group in their Benchmark report (Jutras 2007) provides an insight for those without ERP. What would force companies to implement ERP? Is it the mandate from the parent company, pressure from the customers and suppliers and regulatory compliances which are more on the mid size companies? Aberdeen Group applied the business pressure, actions, capabilities and enablers (PACE) framework for benchmarking the corporate behaviour in specific business processes such as ERP adoption.

2.5.2.2 Concept 2 - Perceived benefits of ERP

Organisations are often attracted by the benefits of ERP that are characterized by integration, flexibility and scaling, attributing to the solution to various requirements. TAM (Davis 1989) and Triandis model (Chang et al. 2008) considered that perceived usefulness or long and short-term consequences are important measures for IS adoption. Amoako-Gyampah and Salam (2004) found out that the belief in the benefit of the ERP system is important in the formation of positive attitude towards the system. Similarly, the barrier or risk poses a challenge and negatively affect the acceptance of the ERP system. Many researchers like Teo et al. (2008); Spathis and Constantinides (2003); Shehab et al. (2004) have studied the benefit and the barrier in the ERP adoption and have listed them.

It is not surprising that the characteristics of much sophisticated software package like ERP can have more potential organisational benefits. This may range from more streamlined and efficient operations to longer-
term business reasons and strategic advantages accruing from the addition of new capabilities and the ability to provide more and better services (Markus and Tanis 2000).

According to the TAM, perceived usefulness and perceived ease of use are major determinants of people’s intentions to use computers and these intentions are found to predict the actual use reasonably well (Davis 1989). UTAUT was formulated from the eight competing theories that help to assess the likelihood of success for new technology and the drivers of acceptance. According to UTAUT, performance expectancy, effort expectancy and social influence, directly affect the intention to use. Intention to use and facilitating conditions in turn directly affect the actual usage behaviour (Venkatesh et al. 2003).

There has been extensive research on the issues concerning implementing these systems and achieving the promised benefits (Kalling 2003). Murphy and Simon (2002) highlighted that determining the potential benefits can broadly be seen as tangible and intangible benefits and reviewed the importance of intangible benefits. They classified the tangibility and quantifiability of the benefits framework developed by Shang and Seddon (2000) on a four-point scale - low, some, mostly or fully. Operational benefits such as cost reduction, cycle time reduction and product improvement are highly tangible and are fully quantifiable. Quality improvement and customer service improvement are somewhat tangible and most of them are quantifiable. Under managerial benefits, most of the performance improvement benefits are tangible and quantifiable. Only some of the resource management and improved decision-making and planning benefits are tangible. In strategic benefit dimension, business growth, building business innovations, cost leadership and generating
product differentiation are somewhat tangible and support business alliance and building external linkages, has a low tangibility. IT infrastructure benefits of building business flexibility are low in tangibility and quantifiability but IT cost reduction can be fully quantified. Increase in IT infrastructure capability is quantifiable to some extent. All organisational benefits such as support to organisational changes, facilitating business learning, empowerment and building common vision are low in tangibility and quantifiability.

Following Murphy and Simon (2002); Al-Mashari et al. (2003); Sammon et al. (2003); Shang and Seddon (2004); Esteves (2008) and Koh et al. (2008) studied the benefit framework as proposed by Shang and Seddon (2000). Singla (2005) discussed the benefit on tangible and intangible categories and business performance factors. Markus and Tanis (2000); Hallikainen et al. (2004) and Chand et al. (2005) discussed on the technical and business benefits as the reason for ERP adoption. Chand et al. developed a 12-cell framework of ERP benefits by combining Zuboff’s (1985) dimensions of Automate, Informate and Transformate with the balanced score card dimensions of benefits such as process, customer finance and innovation. Automate level focuses on the operational benefits, informate level focuses on the tactical benefits and transformate level focuses on the strategic benefits.

Spathis and Constantinides (2003) examined the motives for companies adopting ERP system, and the benefits derived from it, including the problem encountered. The most highly rated perceived benefits are increased flexibility in the information generation, improved quality of reports, integration of applications and easy maintenance of databases. They also found out that real time information, user friendliness of IS,
improved coordination of departments, improved internal communication are being highly rated. Reduced stock levels and cost reduction in operating and administrative heads are also cited.

Oliver et al. (2005) in an internet-based grounded theory approach developed a conceptual category of benefits that are used to justify the adoption of ERP system. They drew the benefit of ERP adoption from various researches and categorized them within the domains of technology, process, organisation and people. From a small scale survey among Finnish enterprises in adopting ERP, Helo et al. (2008) studied how respondents perceived the advantage of the ERP system and found that improved discipline and control such as controllability, quality and the predictability of the business, standardization of process and improved organisational transparency were the most frequently mentioned benefits. Various other benefits like integration of activities, improved reporting, operational discipline, customer/supplier network management, reduced lead-time, real time data, improved reliability of a system, improved on-time delivery were significantly perceived. Improved flexibility and market responsiveness ranked much lower in the benefits.

Elbashir et al. (2008), used a perception-based measure to understand the relationship of business process performance and organisational performance influenced by business intelligence systems, such as ERP. Factor analysis of 22-benefit items loaded into four dimensions, was identified to match the business value-chain model. Increased revenue, reduction in lost sales, increased geographic distribution of sales, enhanced profit margin, increased ROI and improved competitive advantage referred to the organisational benefits. Improved coordination and reduction in transaction with business partners and suppliers, improved
responsiveness from/to suppliers, increased inventory turnover and reduced inventory levels indicated the relationship benefits. Efficiency in internal process, improved staff productivity, reduced cost in effective decision-making and reduced operating cost are identified as internal efficiency benefits. Reduced customer return handling cost, reduced marketing cost and reduced time-to-market products/services contributed to the customer intelligence benefits. Similarly, Bernroider (2008) used the benefit measures for verifying DeLone and McLean’s (2003) updated IS success model for governance of ERP.

Parr and Shanks (2000) argued that the rationale for implementation varies between companies and lie between a range of motivators broadly categorized on technical, operational and strategic benefits. They also found that this difference would to some extent, determine the type and scope for ERP implementation. Similarly, Law and Ngai (2007) on studying the interaction of business process improvement and ERP success with the organisational benefits found out that the firms have different reasons for adopting ERP systems. A most common objective in ERP adoption is cost reduction.

Saatcioglu (2007) analyzed at least 31 benefits gained in the ERP project and found that better management and controlling functions, financial flows control, information flows control, increased IT infrastructure capability, control of flow goods, quickened information response time, and the performance improvement are mainly attributed to information benefits. Least important benefits found out by this study are cycle time reduction, lowered inventory levels, productivity improvement and performance improvement, generating product differentiation and facilitating business learning. These benefits fall under the strategic, operational and
organisational benefit categories. Similarly, Kamhawi (2008) examined the importance of 27 benefit factors of ERP adoption and grouped them as first, second and third level. With an expectation that operational benefit will have more importance among the operational, technical, strategic and decision-making categories of the benefit framework, they found out that the operational, technical and strategic benefit had equal first level benefits.

This study proposes to synthesize the benefits listed by Bernroider (2008), Elbashir et al. (2008), Kamhawi (2008), Murphy and Simon (2002), Singla (2005) and Saatcioglu (2007), and categorise them on the comprehensive framework for classifying benefits of ERP system of Shang and Seddon (2004).

2.5.2.3 Concept 3 - Perceived challenges of ERP

Organisations should understand the information needs and the benefits obtained out of the ERP system as well as the barrier or risk, which poses a challenge. ERP implementation projects are risky undertaking and can impinge on the cost and time expectation. The firm is put into trouble during and after the implementation. The resistance and training requirement stand across the successful adoption. The main challenge of ERP adoption is the failure to properly assess and understand the risks. When risk management is in place throughout the project phases, the success rate of ERP introduction is improved (Aloini et al. 2007).

The compatibility and complexity of ERP systems inhibit the adoption intention (Chang et al. 2008). Perceived complexity as in the Triandis model is the opposite of perceived ease of use in the TAM. Perceived complexity and ease of use have been found to affect the end user satisfaction and thereby restrain the ERP system usage (Kerimoglu et al.
Packaged software like ERP, claim to bring the “Best practices” and are severely under influence of culture and convention of organisations, especially in Asian countries. Due to limited resources and deadlines, organisations are preoccupied and find it difficult to customize ERP modules. Compatibility is positively related to ERP satisfaction and incompatibility may result in not using the ERP systems. Hawking et al. (2004) discuss the role of barriers that result in decreased organisational performance and limit the realization of the benefits.

Panorama Consulting Group’s report on ERP compiled in 2008 identified that the top ERP challenges and risks are the lack of project resources, lack of employees’ buy-in, too small budget and lack of ERP expertise. Lack of executive support, which the consulting group has experienced in implementation, has not figured in the survey results. They interpret that what the respondents identified as challenges, may be the result of lack of executive support. The survey also finds that the core problem was the unrealistic expectation of duration and funding. Helo et al. (2008) identified the disadvantages of ERP system as the difficulty in identifying the logic of ERP System and its complexity, vendor package not being suitable for business requirement, lack of vendor and consultant’s knowledge on industry specific requirements and configuration.

Huang et al. (2004) ranked the top ten risk factors in which lack of senior manager commitment, ineffective communication and training of the users and failure to get user support, top the list. Sumner (2000) proposed an identical list of 12 risk factors applicable to ERP system. Spathis and Constantinides (2003) identified the problems encountered in implementing ERP system and the benefits that have not been fully achieved. The results suggest that the problems may be classified into technical, financial and
organisational. Delay in implementation, resistance to change, data migration and training are cited as the top most problems. Increased errors, friction with ERP providers, board of directors and security are cited as the least concerned problems. Cost, time overrun and difficulty in adapting are other problems found.

The barriers in adapting an ERP system decrease the organisational performance and limit the benefits. When barriers are not solved, they become drivers of risks. Complexity of ERP leads to high-level risk. The risks involved in the adoption of ERP can be categorized as project management-related risk, technology-related risk and process-related risks (Saatcioglu 2007). Kamhawi (2008) studied the challenges in implementing ERP system in Bahrain and he found that all 27-challenges, which were listed, were perceived important by the respondents. He categorized the challenges into four main categories: resources, technical, change management and project management. Time, cost, trained staff, finance and difficulty in resource allocation are termed as resource challenges. Guidance, need, project management, Business Process Reengineering (BPR), transition from old system; experienced implementation partners and alignment of ERP with business plan are grouped as project management challenges. User resistance, top management support, unfamiliarity, change management and user training are identified as change management challenges. Customisation, complex functionality, complex application management, vendor support, dealing with implementation parties, integrating old and new system, security, IT infrastructure and interconnecting functional system are seen as technical challenges.
Nzaou et al. (2008) argued that the virtual wall of principles, policies and practices in ERP adoption process could be used to minimize the challenge. They studied the implementation risks from the adoption stage onward under six main dimensions namely organisational, business-related, technological, entrepreneurial, contractual and financial risk. Pan and Jang (2008) developed a framework for the determinants of the ERP adoption within the technology, organisational and environmental dimensions. They included perceived barriers to ERP adoption and found that it had a negative effect, i.e. adopters` evidently perceived barriers to be less of an obstacle than the non-adopters did. Top management support and a satisfactory level of competence in technology integration were required for adoption decision.

Kim et al. (2005) arrived at a model that links impediments to successful ERP implementation. From the more successful and less successful companies, they investigated the difference between 47 impediments that were taken for study. The impediments were identified to confirm to the major factors: human resource and capability management, cross-functional coordination, ERP software configuration and features, systems development and project management, post implementation (change management and organisational leadership). Koh et al. (2008) also studied the impediments of ERP implementation under the dimensions such as operational, managerial, strategic, financial, technological, organisational and legal impediments. They found that impediments increase both in number as well as in intensity. There was a different perception on benefits and impediments among implementers, users and suppliers (B2B partners). A few studies identify the organisational factors that include CEO and Chief Information Officer’s (CIO) characteristics. Hung et al. (2004) studied CEO’s innovation and his knowledge and attitude towards ERP systems as
crucial factors for adoption. The competence of employees in ERP also plays a significant role in the success of ERP adoption. Similarly, Armstrong and Sambamurthy (1999) found that CIO’s business and IT knowledge, and his/her interaction with the top management team influences the new technology adoption. Law and Ngai (2007) researched the relationship between the senior management support on IT initiatives and that of CEO and CIO/IT distance. Closer the CEO and CIO distance supported the ERP adoption.

This study proposes to synthesize the barriers listed by Saatcioglu (2007) and Kamhawi (2008). The categories such as resources, technical, project management and change management are used to measure the overall challenges. The “change management” was renamed as “people” for a broader meaning of their characteristics. The process related challenges are included into technical dimension. The “project management” is also renamed as “organisational” as in Oliver et al. (2005), to include CEO and CIO characteristics influencing the ERP adoption as discussed by Hung et al. (2004) and Armstrong and Sambamurthy (1999).

2.5.2.4 Concept 4 - Organisational complexity in ERP adoption

Many studies have found out that the organisational characteristics are also significant determinants of organisational IT adoption. Literatures pertaining to organisational characteristics in ERP adoption are also found. The type of the industry has been considered as one of the major factors in ERP adoption. Hung et al. (2004) and Pan and Yang (2008) discovered that the organisational size was the major factor affecting ERP adoption decision. Industry category and the type of manufacturing such as Made to Order (MTO), Made to Stock (MTS), Assemble to Order
(ATO) and Engineered to Order (ETO) have varying requirement of ERP (Deep et al. 2008).

The characteristics of SME’s create a difference in the ERP adoption from large organisations. Buonanno et al. (2005) studied the business factors of SME’s that are composed as the ‘business complexity’. However, as a composed factor, they did not support the prediction of ERP adoption, but organisation size was a good determinant. SMEs disregard financial constraint as a reason for non-adoption but suggest that structural and organisational reasons are the factors in non-adoption of ERP system.

The organisational characteristics frequently found in the prior studies include organisational size (Buonanno et al. 2005; Pan and Jang 2008; Liang et al. 2007; Teo et al. 2003), CEO and CIO’s characteristics and their distance (Armstrong and Sambamurthy 1999; Law and Ngai 2007), size of IT (Teo et al.). Hung et al. (2004) in their study identified organisational characteristics such as employees IS competence, business scale, industrial category and information strength of the organisation. Buonanno et al. (2005) instead of using organisational characteristics as control variable used them as the main variable in their study. They did an exclusive study on organisational characteristics on ERP adoption using ‘Company Size’ (micro, small, medium, large), ‘Market area’ (local, regional, national, international), ‘Membership in an industrial group’ (either as the holding or as a controlled firm), ‘Presence of branch offices’ (localization and number of branches), ‘Level of diversification’ (in terms of products, market, technologies), ‘Degree of functional extension’ (number of activities carried out internally). Liang et al. (2007) defined the organisational size on two variables such as ‘Revenue’ and ‘Number of Employees’. He also used additional variables such as ‘Type of Business’, ‘Ownership’, ‘Absorptive
capacity’, ‘Organisational compatibility’ as the organisational characteristics.

2.5.2.5 Concept 5 - ERP adoption

ERP adoption is the behavioural outcome that is understood as having adopted the ERP system or not having adopted the ERP system. As in TAM, the overt action of adopting an ERP system will be preceded by the intention to adopt ERP. Therefore, the variable can also be considered as a predictable variable for ERP adoption that can be inferred as the intention to adopt or not to adopt ERP system.

2.5.3 Defining the Laws of Interaction of Model

The laws of interaction are the statements of relationship between the units of the theory. Until the linkages or the relationships are specified between the units, the model will be only a taxonomic model, which will just categorise the factors into units or constructs. Dubin (1978) specified three forms of interaction, (1) categoric interactions (2) sequential interactions and (3) determinate interactions. A categoric law of interaction is symmetrical that the value of one unit is associated with values of another unit. Either one of the units may appear first in the statement of the law. Sequential laws of interaction employ a sequential relation between the units. Finally, determinate interaction explains the determinate values of one unit with the determinate values of another unit (Dubin 1978). To represent the law of interaction, arrows connecting each of the units are drawn. A single headed arrow represents the causal relationship and the double-headed arrow represents the correlation or covariance. In the conceptual research model on the motives of ERP adoption, the organisational needs are attractively addressed by the benefits of the ERP
systems and some time terrorizes the organisations with the risk involved in implementing. It can also be understood that beyond the taste of benefits and risks, organisations are forced to adopt ERP systems. Therefore, the following five laws of interaction in the motives that drive ERP adoption are identified for the study (Figure 2.3).

**Figure 2.3  The laws of interaction of conceptual research model on motives that drive the ERP adoption**

Law of interaction 1: The perceived benefits will mediate the influence of the institutional isomorphic pressures on ERP adoption decision.

Law of interaction 2: The perceived challenges will mediate with the influence of institutional isomorphic pressures on ERP adoption decision.
Law of interaction 3: The organisational complexity will mediate with the influence of institutional isomorphic pressures on ERP adoption decision.

Law of interaction 4: The institutional isomorphic pressures directly influence the ERP adoption decision.

Law of interaction 5: Organisational complexity influences perceived challenges and thereby alters the perceived benefits.

2.5.4 Defining the Boundaries in the Model

The conceptual model needs to be confined to a particular context by drawing a boundary. Any geometrical shape can be used to enclose the model to represent the boundary. The boundary can be extended to represent the whole context and the smaller area to which the model will be applicable. The boundaries define the domain over which the conceptual model applies. Conceptual models are representation of the real world and the boundaries specify which aspects within the real world does the model present and what it does not. The conceptual model will hold well within the specified boundaries. Universal theories will have a single boundary. When many criteria are used to determine the boundary, then the domain is reduced to the extent that the size of the population equals one and generalization is not broad. The boundaries are specified under two broad categories, (1) Internal criteria: based on the units and law of interaction in the model, (2) External criteria: imposed from outside the theory, where usually a new variable or interaction is found after empirical study. These are regarded as factors not included in the conceptual model.
The complexities of the ERP system provide a vast boundary. The conceptual model is arrived by considering the behavioural decision theory, which explains the decision-making strategies where the effort and value stand as the criteria in the choice. This cost-benefit paradigm forms the base for the ERP adoption decision. As the cost-benefit analysis is suitable for both tangible and intangible measure of cost and benefits, a broad picture of the phenomenon is arrived at. The conceptual research model proposes a theory that predicts the motives that will drive the ERP adoption among the non-adopters, but the non-adopters will include a significant population and we have to limit to the distinctive organisations, which requires ERP system but has not adopted one. To identify the potential organisation, that will require ERP system, the business and organisational characteristics are used as a qualifying factor. The business firms with this qualifying factors form the area within which the proposed theory will hold good (Figure 2.4).

![Boundary of the theory](image)

**Figure 2.4 Boundary of the theory**
2.5.5 Defining the System States of Model

While arranging the units of the model, it is necessary to identify the causal relationship and represent them systematically to create a flow of process. Defining a system state is representing the condition in which the units of the theory interact differently. To identify the system state of the system the theory is first considered as a system. In order to consider a theoretical model as an overall system three criteria - inclusiveness, determinate values and persistence must be fulfilled. This means that the units are measurable and produce a distinct value or range of value and should be persistent over a time. Nevertheless, not all theoretical models can have the system states specified. The system states are easy to be explained from the outcomes. In the conceptual model of this study, the outcomes can be identified as adaptors and non-adopters. Therefore, the system state can be explained as how the units and their interactions are different between the organisations that have adopted and not adopted ERP.

The ‘state’ is a key concept of a system theory. In this context, the “state” refers to the condition. A system theory explains about the input and output and its relationship that is understood as influence and reaction. In system theory, two types of system state can exist; one is the discrete system and other is the continuous system. System theory distinguishes between continuous systems and discrete systems. A discrete system will produce an outcome, when the input is given. The output is observed in a discrete fashion, present or not present. In a continuous system, the influence of the input on the output varies. The effect of the input produces a varying output that lies between high to low.

In the conceptual research model on ERP adoption, the institutional isomorphic pressures are taken as the input. The process of
decision-making is done by cost-benefit analysis by looking the perceived benefits of ERP adoption, the perceived challenges in ERP adoption and the degree of complexity of the organisational activities. The outcome of this model is the ERP adoption, which is measured as a continuous factor between who have adopted and will not adopt the ERP system. The system state depicting the input, process and output is shown in Figure 2.5.

![System state of the conceptual model](image)

**Figure 2.5** System state of the conceptual model

### 2.5.6 Define the Propositions

The next step in conceptual research model building is the process of developing the propositions. The propositions are logically developed from the units, laws of interaction, boundaries and the system states. Propositions are important for the empirical testing of the model (Holton and Lowe 2007). An important objective of any conceptual research model is to generate predictions from the empirical information available. The prediction is usually in the form of a proposition. Dubin (1978) identified three classes of propositions. 1) The prediction of the value of a single unit from the value of the other units in the model 2) The prediction is about the
continuity of the model by finding the conjoined values of all units in the system and 3) Predict the system state, when the system is dynamic.

Propositions 1 to 9 are proposed between two units of the model. Propositions 10 to 12 are proposed by involving three units together from the model. Proposition 13 is proposed by including all the variables in the model.

Proposition 1 (P1) Higher institutional isomorphic pressures lead to higher intention to adopt ERP.

Proposition 2 (P2) Higher institutional isomorphic pressures lead to higher perceived benefits.

Proposition 3 (P3) Higher institutional isomorphic pressures lead to reduced perceived challenges.

Proposition 4 (P4) Higher institutional isomorphic pressures lead to higher organisational complexity.

Proposition 5 (P5) If the perceived benefits are high, then the intention to adopt ERP system is stronger and positive.

Proposition 6 (P6) If the perceived challenges are high, then the intention to adopt ERP system is negative.

Proposition 7 (P7) If the organisational complexity is high, then the intention to adopt ERP system is positive.

Proposition 8 (P8) Higher organisational complexity will reduce the perceived challenges.

Proposition 9 (P9) Higher perceived challenges will reduce the perceived benefits.
Proposition 10
(P10) Perceived benefits will support the institutional isomorphic pressures and lead to stronger and positive ERP adoption intention.

Proposition 11
(P11) Perceived challenges are compromised in higher institutional isomorphic pressures and lead to stronger and positive ERP adoption intention.

Proposition 12
(P12) Higher organisational complexity will support the institutional isomorphic pressures and lead to stronger and positive ERP adoption intention.

Proposition 13
(P13) Higher level of perceived benefits, Lower level of perceived challenges and higher level of organisational complexity will mediate the higher level of institutional isomorphic pressures and lead to stronger and positive ERP adoption intention.

2.5.7 Model Evaluation

A conceptual model needs to be evaluated by the stakeholders based on two basic criteria, namely the theoretical soundness and the modelling taxonomy. The underlying theory of a model is evaluated against Patterson’s (1986) criteria. The quality of the model is evaluated on the principles of design science as used in the information systems. This helps the researcher to use Structural Equation Modelling (SEM) techniques that have a Graphical User Interface (GUI) where the user can draw the model and easily perform a complex statistics. The most referred conceptual model evaluation in design science is the Bunge, Wand, and Weber ontology (BWW approach). They define that the quality of a model is determined through its compliance to reality. The quality of a model is expressed through its degree of ontological completeness and clarity (Recker 2005).
Table 2.2 Quality parameters for a conceptual model evaluation

<table>
<thead>
<tr>
<th>Clarity</th>
<th>Easy to understand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simplicity</td>
<td>Parsimony and understood quickly</td>
</tr>
<tr>
<td>Expressiveness</td>
<td>Describes the reality in details</td>
</tr>
<tr>
<td>Minimality</td>
<td>Does not contain redundant concepts</td>
</tr>
<tr>
<td>Completeness</td>
<td>Covers all the aspects of the particular application domain</td>
</tr>
<tr>
<td>Accurate</td>
<td>Conformity to the reality</td>
</tr>
<tr>
<td>Abstract</td>
<td>Does not go down in detail, but rather remains at a high abstraction level</td>
</tr>
<tr>
<td>Consistent</td>
<td>The diagrammatic standards are consistent throughout</td>
</tr>
<tr>
<td>Un-ambiguous</td>
<td>The arrows are clearly directed and all the units are linked</td>
</tr>
<tr>
<td>Testable</td>
<td>The model is translated into testable hypotheses</td>
</tr>
<tr>
<td>Recopyable / Reproducible</td>
<td>The model is easily represented in different Media and is reproduced for computerized analysis</td>
</tr>
</tbody>
</table>

Various quality parameters for evaluating a model as discussed in literature (Green and Rosemann 2001; Rosemann and Wyssusek 2005; Cherfi et al. 2007) are compiled in the Table 2.2.

Delphi technique is used to evaluate the model in which the external reviewers are asked to evaluate the initially developed model on quality parameters. At the end of each round, the results of the previous evaluation serve as a feedback to experts who are asked to consolidate their answers even more focused. After several rounds, the opinion of the experts will help to arrive at a consensus and the researchers can average the final
responses towards the conclusion. This method is a powerful and efficient way of drawing together the distributed expertise.

During the evaluation of the model by experts, if the researcher finds any disconfirmation on the concept or idea and their relationships, there is a need for modifying the model. The comments of the scholars are grouped based on the various criteria that are used for evaluation and finally these comments are synthesized. A qualitative approach is used for analyzing the feedback because of the smaller data and subjective responses. Based on the analyses, literatures are again reviewed to find out the critical relevance of change that is required for the model. The additional research articles add value and justify the modification.

The model modification may be done on the theoretical perspective or on the structural perspective. Theory is modified based on the evidence offered by the research. In many instances, modification is done to clarify and make the model complete from what was previously presented. For example, units may be added, deleted or expanded. The interactions are modified by adding, deleting a link or by introducing a moderating or mediating factor. The structural modification is usually done by moving the elements for more clarity in representation.

Based on the scholarly comments on the proposed model, the definitions of the units or other keywords should be modified to be clear and complete. The conceptual model development cannot be expected to be perfect from a single perspective. When scholars suggest a modification, it should be verified with further review of the concerned literature. When a modification is justified, the initial conceptual model can be modified (Holton and Lowe 2007).
2.6 GENERATION OF HYPOTHESES

Propositions are statements about observable phenomena (concepts) that may be judged as true or false. When a proposition is formulated for empirical testing, it can be called as a hypothesis (Cooper and Schindler 2006, p. 43). The first set of hypotheses (Table 2.3) is developed for the basic structural model and an additional set of hypotheses is developed for the mediation effect (Tables 2.4 and 2.5).

Table 2.3  First set of hypotheses on the initial model proposed for the study

<table>
<thead>
<tr>
<th>Proposition Number</th>
<th>Hypothesis Number</th>
<th>Hypothesis Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>H1</td>
<td>H1\textsubscript{0} Institutional isomorphic pressures will not influence the ERP adoption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H1\textsubscript{a} Institutional isomorphic pressures will influence the ERP adoption</td>
</tr>
<tr>
<td>P2</td>
<td>H2</td>
<td>H2\textsubscript{0} Institutional isomorphic pressures will not influence the perceived benefits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H2\textsubscript{a} Institutional isomorphic pressures will influence the perceived benefits</td>
</tr>
<tr>
<td>P3</td>
<td>H3</td>
<td>H3\textsubscript{0} Institutional isomorphic pressures will not influence the perceived challenges</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H3\textsubscript{a} Institutional isomorphic pressures will influence the perceived challenges</td>
</tr>
</tbody>
</table>
Table 2.3 (Continued)

<table>
<thead>
<tr>
<th>Proposition Number</th>
<th>Hypothesis Number</th>
<th>Hypothesis Statement</th>
</tr>
</thead>
</table>
| P4                  | H4                | H4₀: Institutional isomorphic pressures will not influence the organisational complexity  
                             H4ₐ: Institutional isomorphic pressures will influence the organisational complexity |
| P5                  | H5                | H5₀: Perceived benefits will not influence the ERP adoption  
                             H5ₐ: Perceived benefits will influence the ERP adoption |
| P6                  | H6                | H6₀: Perceived challenges will not influence ERP adoption  
                             H6ₐ: Perceived challenges will influence ERP adoption |
| P7                  | H7                | H7₀: Organisational complexity will not influence ERP adoption  
                             H7ₐ: Organisational complexity will influence the ERP adoption |
| P8                  | H8                | H8₀: Organisational complexity will not influence perceived challenges  
                             H8ₐ: Organisational complexity will influence the perceived challenges |
| P9                  | H9                | H9₀: Perceived challenges will not influence perceived benefits  
                             H9ₐ: Perceived challenges will influence perceived benefits |
Table 2.4 Second set of hypotheses on the mediation effect

<table>
<thead>
<tr>
<th>Proposition Number</th>
<th>Hypothesis Number</th>
<th>Hypothesis Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>P10</td>
<td>H10</td>
<td><strong>H10</strong>&lt;sub&gt;0&lt;/sub&gt; Perceived benefits will not mediate the institutional isomorphic pressures towards ERP adoption</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>H10</strong>&lt;sub&gt;a&lt;/sub&gt; Perceived benefits will mediate the institutional isomorphic pressures towards ERP adoption</td>
</tr>
<tr>
<td>P11</td>
<td>H11</td>
<td><strong>H11</strong>&lt;sub&gt;0&lt;/sub&gt; Perceived challenges will not mediate the institutional isomorphic pressures towards ERP adoption</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>H11</strong>&lt;sub&gt;a&lt;/sub&gt; Perceived challenges will mediate the institutional isomorphic pressures towards ERP adoption</td>
</tr>
<tr>
<td>P12</td>
<td>H12</td>
<td><strong>H12</strong>&lt;sub&gt;0&lt;/sub&gt; Organisational complexity will not mediate the institutional isomorphic pressures towards ERP adoption</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>H12</strong>&lt;sub&gt;a&lt;/sub&gt; Organisational complexity will mediate the institutional isomorphic pressures towards ERP adoption</td>
</tr>
</tbody>
</table>

Table 2.5 Third set of hypothesis on the multiple mediation effect

<table>
<thead>
<tr>
<th>Proposition Number</th>
<th>Hypothesis Number</th>
<th>Hypothesis Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>P13</td>
<td>H13</td>
<td><strong>H13</strong>&lt;sub&gt;0&lt;/sub&gt; Perceived benefits, perceived challenges and organisational complexity together will not mediate institutional isomorphic pressures towards ERP adoption</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>H13</strong>&lt;sub&gt;a&lt;/sub&gt; Perceived benefits, perceived challenges and organisational complexity together will mediate institutional isomorphic pressures towards ERP adoption</td>
</tr>
</tbody>
</table>
2.7 THE FINAL MODEL

Drawing upon Dubin’s (1978) conceptual theory building process by defining the units, the law of interaction, the boundary and the system state, a conceptual model as shown in the Figure 2.6 is arrived at. This study proposes that the institutional isomorphic pressures act as a driving force mediated by the perceived benefits, perceived challenge and organisational characteristics towards decision to adopt ERP as their enterprise solution.

Figure 2.6 Proposed conceptual research model and hypothesised relationships

The proposed model includes the institutional force because of the dependence of the SME in the supply chain, evaluation of the benefits and challenges for economic justification, and the organisational complexity to
characterise the SME’s organisational functions. The model is proposed in such a way to investigate any change in their impact on the outcome when they interact between each other.

2.8 SUMMARY

This chapter has provided the theoretical foundation for the study. An initial review of literature helped to examine the status of the studies in the adoption of ERP among SMEs. Various theories were compared and the analysis led to the identification of the need to study on the intervening effect factors that influence the ERP adoption among the SMEs. This chapter also explains how the concepts and their relationships are framed into a conceptual model that will guide research. While building the conceptual model, literatures were again reviewed on the narrow area of the concepts that are chosen for the study. The outcome of the chapter provides the propositions of the study that are designated as hypotheses that can be tested by an empirical study. In the following chapter, the research method designed for the study is described, and this includes the empirical data gathering process to test the hypotheses and the overall model.