Chapter 1: Introduction
1. Introduction

Advances in information and communication technology ushered in radical changes in social structure and culture, in terms of social relations at both the work place and outside the work place and also in the means of communication. The information and communication technology has led to collapse of space-time barriers. In one sense, today's technological revolution is not new. In the past century, impressive advances in transportation, communications and medicine have changed the life style as well as the work culture of the people. What is different now is the convergence and interaction of many strands of technological change-with social consequences far more profound, far more difficult to foresee (Hallberg and Bond, 1999).

We are in the information age, the latest phase in the evolution of human civilisation and markers of a civilisation are the tools and techniques of the time. The earlier evidence of using tools for improved living conditions was found during the Stone Age. The agricultural revolution was the next epoch in the progress of human civilisation, with its more sophisticated tools and practices that increased food production and other facilities through improved technology. The mass production and distribution was the characteristic of the Industrial Revolution. The advent of computers has marked a new era in the civilization with the information technology (IT) revolution, which is speeding forward with full steam. The revolution changes the value system and the paradigm which we have been accustomed to (Philip, 2001). Now we are dealing with commodities that are intangible and invisible. In this new age, information is the most valuable commodity. Everything else depends on the accessibility one has to the wealth of information. The technology used at a
particular time would determine the kind of goods produced and transacted at that time. In the age of information, the primary "good" for transaction is information. The primary means of exchanging information is communication (Philip, 2001).

1.1 Sociology of Technology:

Many sociologists have focused on the interaction between technology and society. Functionalists viewed technology not only as an instrument in developing the economic status but also causing functional interdependence leading to social cohesion. They have viewed motivation and recognition of individual as a part of technological production as the hallmark of technology. In the emergence of technology, values and beliefs of people become determining factors, creating particular elements of technology.

Technology has been viewed differently by different social scientists. For Davis (1981), technology meant 'application of knowledge to physical phenomena' and it is relevant to study this with reference to culture because the culture of man started with tools and devices. Merton (1949) observes that the socio-economic factors determine the scientific research, creating needs where needs are not found and thus causing conflict between 'morality of science' and 'morality of ordinary behaviour'. Davis suggests that technology would minimise the conflict and thus facilitate science in reaching its goal of scientific truth. Technology for Parsons (1951) meant 'mobilisation of resources to achieve a particular goal' and it is determined by the 'conditions of success' and 'cost'. The cost would not only mean in economic sense, but also the cost of sacrificing other technologies. Taking cue from Pareto, Parsons (1949) observes that the relations between means and ends can be called a
technological element because only then it becomes a logical action. Then efficiency of technology would mean, the effectiveness of a technology process relative to cost (Parsons, 1951).

1.2 Technology and Knowledge:

While on the psychological plane technology results in motivation of individual towards the best opted out technologies and balancing costs, on the sociological plane, technology results in collective organisation of resources for which appropriate 'role allocation' and 'institutional means' to achieve the goals would matter. Therefore, technology is functional in the sense that it not only elevates the status of an individual and society by making a lot of facilities feasible but also calls for a group activity thus facilitating 'collective conscience'. If we were to analyse technology development in Durkheimian sense, we can assertively say that it is improving group cohesion and the collective conscience by making collaborations imperative. The technological change, as viewed in terms of a social system, would be definitely managed by the society because of its dynamic nature (Parsons, 1951).

Thus for functionalists technology includes not only the material tools but also the non-material and ethical aspects. Technology, which is a means, causes conflict only when it becomes an end in itself. In order to keep pace with the technological developments, if irrelevant technologies are adopted and unmanageable consequences crop up, the same technology would cause chaos which becomes irreplaceable. From the sociology of knowledge point of view technology and knowledge are considered as one and the same. Therefore, as technology develops, knowledge also develops. This growth in scientific and
technological knowledge facilitates and also gets facilitated by organisational learning. Thus we can say that organisational learning and technology development are parallel processes.

Knowledge is information abstracted from reality and is conceptualised and expressed in a system of shared symbols. Merton (1968) differentiates between knowledge and information. Knowledge is systematically connected body of facts and beliefs which otherwise individually constitute information. The basic assumption of sociology of knowledge is that knowledge is socially and culturally conditioned.

Karl Manheim (1936) gave a separate disciplinary status to sociology of knowledge as a response to German idealism. He conformed to Marxian conception of control of knowledge by extra-cognitive factors, but refused to accept that class is the only social category that conditioned knowledge. The groups needn't be only of economic nature but also be occupational groups and status categories that can condition knowledge.

According to him, all knowledge, except scientific knowledge, is socially and culturally conditioned. Scientific knowledge for Manheim is universal, invariant, objective and atemporal. Manheim subscribes to positivist - rationalist philosophy of science. Manheim seems to have identified two dominant models of thought, viz., aspirations and intentions which form the main content of knowledge and are controlled by the social order (Eisenstadt, 1987). He was in consonance with Durkheim's group affiliations and collective conscience. Merton (1957) in his critique of Manheim observes that Manheim identified certain spheres of knowledge but could not really establish the connection between thought and society, as he believed that identification of groups and their ideological affiliations have to be empirically investigated. This is fallacious, as Merton says, because, if the relationship
between a particular sphere of knowledge and society is not established, it becomes difficult to devise a research problem for empirical investigation.

Manheim also gave three points to avoid fallacies in sociology of knowledge. In his view, a theory has to be contextually relevant, appropriate and adaptable to social conditions.

"A theory is wrong if in a given practical situation it uses concepts and categories, which, if taken seriously, would prevent man from adjusting himself at that historical stage." (as quoted in Merton, 1968, p557).

According to rationalist epistemology, scientific knowledge is rational, universal, aterriporal and objective. Sociological explanation is needed only to account for irrational beliefs in science. However, the recent developments in sociology of knowledge attempt to show that all knowledge is socially caused (Bloor, 1976). Thus, the sociology of science has widened its gamut of operations from mere analysis of the social and moral aspects of science to the content and the process of social production of scientific knowledge and innovations, thus opening up not only the social organizational aspects but also the construction of the content of science to sociological scrutiny.

1.3 Definition of technology

Technology as a body of systematic knowledge, associated practices, values and meanings is embodied in a variety of economic organisations and social institutions. Technology has two dimensions: design and control. Design incorporates functional aspects and control dimension deals with social organisation needed to implement technology and who will be included to access it and who will be excluded from accessing it.
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Technology includes artifacts, knowledge underlying the construction of the artifacts and social organization required to implement technology. We have seen that knowledge is built into technology. Then technological change would also mean knowledge change, change in information levels, perceptions and concepts. It would also mean change in practices, cultural as well as technical. Technological change according to Parayil (1991) is, "the outcome of activities that humans engage in and through their collective or individual organizational structures, to optimise their resources subject to constraints imposed by their own limitations in tandem with that of the environment."

According to Saviotti (1986), any technological change is supposed to be having two characteristics: technological and service characteristics which are complementary to each other. The interface between the internal environment of the technological system and the external environment is represented by the service characteristics which provides the link between the technology and the external environment.

In the foregoing paragraphs we have seen the social origins of knowledge. Conventional thesis of technological determinism argues that technology shapes society and brings about social change but it is external to the social world and is seldom influenced by the society (See Mackenzie et al, 1998). By contrast, the social shaping of technology approach corrects the fallacies in this notion by arguing that technology and society are mutually dependent entities. There seemed to be two broad approaches, micro and macro- to social shaping of technology (See Mackay & Gillespie, 1992). Three different schools of thought may be identified in the micro approach;
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(1) the social constructionist approach which suggests that technological systems emerge out of choices between social groups and technology is socially constructed. (2) the 'systems' approach which focuses on technologists as 'system builders' and postulates that heterogeneous people, disciplines and organizations form a part of 'seam less web' (Hughes, 1992) and

(3) the actor- network theory which gives a comprehensive approach to understand the development of technology focusing on the relations between actors of technical and non-technical world.

The social constructionist approach as given by Bloor (Bijker et al, 1987), highlights that, knowledge and knowledge claims are socially constructed. That is, explanations for acceptance and rejection of knowledge claims are sought in the social domain. This approach has given way to empirical research to understand the processes of construction of scientific knowledge in various contexts. This approach has paved way for a new understanding of the relationship between science and technology. Many studies have been carried out to understand the nature of technology and its dependence on science. According to Layton (1977, Pg 210), “Science and technology have become intermixed. Modern technology involves scientists who do technology and technologists who function as scientists. The old view that basic sciences generate all the knowledge which technologists then apply will simply not help in understanding contemporary technology". He also says "the divisions between science and technology are not between the abstract functions of knowing and doing. Rather they are social”. (as quoted in Bijker, 1987).
Scientists and technologists are seen to be constructing their respective bodies of knowledge and techniques drawing their resources from each other. Thus Pinch and Bijker (1987) say that there is no sense in considering the relationship between science and technology as unidirectional. According to them, technology studies gain more prominence in the recent literature, which can be studied under three categories viz., innovation studies, history of technology and sociology of technology. The innovation studies are carried out by economists to understand the conditions for success in innovation. The historians of technology study the historical conditions that led to success or failure of innovations. The third and the most important is the sociology of technology which appears to be more promising in giving social explanations not only for success or failure but also looks into the organizational aspects of technology.

Edward Constant (1989) relates technology to the social context. There are two broad traditions identified by him in the treatment of technology, i.e., intellectual and artifactual accounts that have their origins respectively in the two approaches in the history of science and in organisational accounts with business & economic history. The first tradition followers of Layton have seen technology as knowledge. The adherents to the second tradition focused on entrepreneurship and technological change in the context of complex organisations. In the first view scientific progress plays a significant role in technological change, where as in the second view, market demand, entrepreneurial creativity and other economic factors dominate. To put it in a nutshell, technological determination in the organisational context can be debated as to whether

- technology determines/shapes organisation
or organisations determine/shape technology

or both are linked to each other in a dynamic interactive matrix that involves external factors as well.

Many historians of technology like Thomas P. Hughes (1983), Alfred Chandler (1977) and Nathan Rosenberg (1982) studied the development of large scale, integrated technological systems and their concomitant organisations. According to Constant (1989), three social loci are identified for technological practice: the technological community, the complex organisation (corporate) and the technological system.

Hughes' notion of technology as a system can be seen in his "Networks of Power" (1983), in which his model consists of three interrelated structures.

- a temporal stage model for the development of technology
- each stage characterized by reverse salients in the advancing technological front. The reverse salients are decomposable into subsidiary critical problems that attract the relevant practitioners.
- each developmental phase, produces a specific culture of technology composed of distinctive values, ideas and institutions.

Technological momentum is created in large scale organisations and institutions by this culture of technology which finally determines the technological trajectory of the organisation. Yet this complex model does not indicate any technological autonomy according to Hughes, who vehemently argues, that, the interaction of various properties of technology with a wide array of geographical, economic, political and historical contingencies determine technological development. Critically reviewing Hughes's model Constant (1989,
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P 231) says no technological system is adopted in its entirety. He says "Purchase or use of any modern technology is mediated by the complex organisations that are required to integrate the knowledge and resources necessary to produce and distribute the artefact or service".

This organisationally mediated function of technology has two implications:

- Technological knowledge is never autonomous or independent of the content for it to be expressed as a functional artefact, it needs to be mixed with other forms of knowledge, which means it needs multiple communities of practitioners working together.

- This implies a complex organisation is required for the performance of this technological function.

Constant (1989, P 232) says, "If technology as knowledge finds its home in communities of practitioners and their associated professional societies and educational programs, then technology as function has as its locus complex organisation". Organisations with their distinct behavioural characteristics, goals and values need to work together to meet the targets as technological efficiency, quality, reliability, service, style, harmony of operation, expected resale value etc. And all these are the matters of organisational decisions and efficacy rather than straightforward technical solutions to straightforward technical problems. Thus technology is mediated by organizational variables.

While in order to take up complex technological functions, complex organisations are needed, then their internal differentiation and departmentalisation becomes the focus. Structure of a typical manufacturing organization is given by Chandler (as quoted in Constant, 1989, P) which sees the large business organisations not as the result of process of
internal differentiation and specialisation, but as the result of process of successive inclusion. (Fig 1.1).

"Large enterprises internalised separate steps in the sequence of production of distribution that traditionally had been performed by separate business units whose activities were coordinated by market transactions".

**Figure 1.1: Structure of a typical manufacturing organization**

Source: Constant II, Edward W (1989)

Chandler, (as quoted in Constant, 1989) thus gives the above organizational structure depicting compartmentalisation of modern organisations in which the managerial efficiency plays a major role. Chandler's portrayal of organisational development provides the link between the technological knowledge and organisations in systems perspective.
However, today's business organisations aim more at knowledge acquisition through collaborations. Thus today's technology development takes place through a multitude of interorganisational collaborations.

1.4 Organisational Collaboration:

There has been an impressive accumulation of studies focusing on interorganisational collaborations and networks during the last decade. However, the growth in the number of these studies seemingly does not ensure a clear accumulation of knowledge or even conceptual consolidation. Indeed, the variety of research that has been devoted to the analysis of inter-organizational collaborations and networks over recent years is breathtaking (for nature, scope, overview, and reviews of organisational collaboration see Alter and Hage 1993; Auster 1994; Axelsson and Easton 1992; Burt 1992; Contractor and Lorange 1988; Ebers 1997; Ebers and Jarillo 1998; Gulati 1995; Grabher 1993; Grandori and Soda 1995; Hakansson and Snehota 1995; Jarillo 1993; Mizruchi 1994; Mizruchi and Galaskiewicz 1993; Nohria and Eccles 1992; Osborn and Hagedoorn 1997; Powell and Smith-Doerr 1994; Staber et al. 1996; Swedberg 1997; Sydow 1992, 1996 - as quoted in Oliver, 1998).

Strategic collaborations (also referred to as collaborations) have emerged in recent years as a popular strategy in an environment in which fast access to up-to-date technology and emerging markets is more critical than ever (Deeds & Hill, 1996; Mitchell & Singh, 1996; Yoshino & Rangan, 1995). Generally speaking, strategic collaborations are a form of cooperative arrangement between organizations. Even so, there is some ambivalence when it comes to precisely classifying what types of cooperative arrangements can be termed strategic collaborations. Researchers who are in favor of a more inclusive approach maintain
that virtually all kinds of inter-firm arrangements should be called strategic collaborations (Borys & Jemison, 1989; Forrest, 1992; Lei & Slocum, 1991; Murray & Mahon, 1993; Stafford, 1994). In this approach, under the rubric of strategic collaborations, there are various kinds of arrangements: joint ventures, equity investment, licensing, joint R & D arrangement, technology swap, buyer-supplier relationship, and others. On the other hand, some researchers have adopted a more restricted view, and have sought to make a distinction between strategic collaborations and other cooperative arrangements (Devlin & Bleackley, 1988; Yoshino & Rangan, 1995). For them, strategic collaborations refer only to those deals in which the parent firms are tied to each other in a substantive manner, i.e., long-term interdependence, shared control, and continued contributions by the parent firms. Thus, in this narrower conception, it seems that only a few selected kinds of cooperative arrangements would qualify as strategic collaborations, and would include joint ventures, equity investment, joint R & D, and joint marketing. For the present study it is not important to differentiate between narrowly defined strategic collaborations and other types of inter-firm cooperative arrangements. The present study adopts a broader view of strategic collaborations, which includes all the cooperative arrangements that are mentioned above (Joint Venture, Strategic Alliance, Equity Investment, Licensing, Joint R&D, Technology Swap, Buyer-Supplier Relationship, Joint Marketing, Partnership, Tie-Up, etc. Also the concept of Organisation is used in broad sense to indicate various forms — Company, Firm, Agency, etc.)
1.5 Factors Leading to Increased Collaboration according to Bernbom (1999):

- Need for integration of institutional information resources in their various formats.
- Laws, regulations, and litigation in which access to information is required.
- Management trends such as process reengineering that influence the ways information is used.
- Need to support cross-disciplinary work and share information across traditional boundaries.
- Interest in exploiting the potential of technology for managing information.
- Growing awareness that digital information resources are at risk of being lost forever.

1.6 Factors Impeding Collaboration according to Bernbom (1999):

- Lack of financial resources.
- Difficulties with inter-unit communication and organizational issues such as territoriality.
- Lack of support from upper management.
- Fear of change.
- Short-term thinking, with no recognition of the need for information management.
- Unavailability of a sufficient workforce to continue present operations and address new needs.
- Fluidity of technology, which makes it difficult to know when to take action.
Absence of standards or agreed-upon practices for long-term management of digital information.

1.7 Network Organisation:

What defines a network organization? The behavioral view is that a network is a pattern of social relations over a set of persons, positions, groups, or organizations (Sailer, 1978). This definition is useful because it emphasizes structure and different levels of analysis. A strategic view of networks considers them "long term purposeful arrangements among distinct but related for-profit organizations that allow those firms in them to gain or sustain competitive advantage (Jarillo, 1988)," a perspective which duly recognizes goal-directed processes and economic competition. A third definition incorporates organic adaptation and flexibility, suggesting they are:

"... adapted to unstable conditions, when problems and requirements for action arise which cannot be broken down and distributed among specialists' roles within a hierarchy. ... Jobs lose much of their formal definition ... Interaction runs laterally as much as vertically. Communication between people of different ranks tends to resemble lateral consultation rather than vertical command [and] omniscience can no longer be imputed to the head of the concern." (Lawrence and Lorsch, 1967)

Network organizations are defined by elements of structure, process, and purpose. Structurally, a network organization combines co-specialized, possibly intangible, assets under shared control. Joint ownership is essential but it must also produce an integration of assets, communication, and command in an efficient and flexible manner. Procedurally, a network organization constrains participating agents' actions via their roles and positions.
within the organization while allowing agents' influence to emerge or fade with the development or dissolution of ties to others. As decision-making members, agents intervene and extend their influence through association; they alter the resource landscape for themselves, their networks, and their competitors and in the process can change the structure of the network itself. Then, a network as an organization presupposes a unifying purpose and thus the need for a sense of identity useful in bounding and marshalling the resources, agents, and actions necessary for concluding the strategy and goals of purpose. Without a common purpose, agents cannot discern either the efficacy or desirability of association or know whether actions are directed towards cooperative gains. These three design elements — co-specialized assets, joint control, and collective purpose — distinguish network organizations from centralized organizations, inflexible hierarchies, casual associations, haphazard societies, and mass markets.


1.7.1 Basis for Collaboration:

Broadly there are three bases for collaboration - resource base, technology base and risk base. The resource dimension addresses what an organisation contributes to the collaboration, technology dimension looks into the transfer of technology from haves to
have nots, while the risk dimension portrays what an organisation may fear most. Naturally, organisations would attempt to obtain maximum returns from the resources they commit to the alliances, gaining from the technology transfer and paying close attention to the risks they are exposed to (Ring & Van de Ven, 1992). Thus, these three dimensions capture the critical concerns of prospective collaboration partners.

1.7.2 Resource-based view of Strategic Collaborations:

Popular theories that have been applied to strategic collaborations include transaction cost economics (Williamson, 1985), game theory (Parkhe, 1993), exchange theory (Gulati, 1995), strategic behavior model (Hagedoorn, 1993), dialectical model (Das & Teng, 1996a), and resource-based view of the organisation (Eisenhardt & Schoonhoven, 1996). The resource-based approach examines competition based on the resources possessed by the organisation, rather than on the basis of its products (Wernerfelt, 1984). It has been argued that it is the organisation-specific resources which directly lead to an organisation's competitive advantage (Barney, 1991). Organisation-specific resources include brand names, skilled personnel, machinery, capital, and so on. Tangible resources may include physical assets and financial assets, while intangible resources may include human, managerial expertise, and reputation (Hofer & Schendel, 1978; Grant, 1995).

In the field of strategic collaborations, however, a resource-based view is yet to be fully developed. Though there are some studies examining the effects of resources in strategic collaborations / alliances (Blodgett, 1991; Hennart, 1988; Lyles & Reger, 1993; Parkhe, 1991), they are mostly from other theoretical perspectives (e.g., transaction cost economics and the bargaining model). Therefore, existing studies on strategic collaboration
lack a theoretical focus on the question of resources. In the resource-based view, the concept of "resource" is multidimensional and it can be differentiated into several types of resources (Barney, 1995). Existing studies have not systematically examined the effects of each major type of resource in strategic collaborations. Indeed, the resource-based view informs us that various types of organisation-specific resource would have different kinds of effects on the collaboration making process. If an organisation's core competence is built on its unique resources, then a strategic collaboration as a way of pooling the core competencies of various partners should be critically related to the type of resource contributed by each partner. Hence, the present study identifies three basic types of resources that the partners bring to collaborate and proposes a more comprehensive and integrated resource-based view of strategic collaborations.

In essence, strategic collaborations are about accessing resources that a particular organisation does not already possess, yet which are critical for improving its competitive position. Badaracco (1991), for example, observed that embedded knowledge of the firm, an organisation-specific resource, drives the firms into strategic collaborations. On one hand, a key motive for entering into collaborations is to combine the resources of the partners (Devlin & Bleackley, 1988; Pisano & Teece, 1989). Reciprocal strengths and complementary resources, or "a 'fit' between partners" are identified as a premise for successful alliances (Parkhe, 1991). On the other hand, a particular organisation may attempt to learn the skills or to steal the resources possessed by another firm through forming a collaboration (Hamel, 1991; Kogut, 1988). Thus, one hidden agenda behind entering into a strategic collaboration could be to gain access to organisation-specific resources otherwise unavailable to a
company. Hidden agendas tend to come into play with greater intensity regarding intangible resources than for tangible resources.

Based on an analysis of the various types of resources mentioned in the literature, it can be proposed that those types of organisation-specific resources which are significant in strategic collaborations can be classified into three basic categories: financial, physical, and managerial. Financial resource refers to the availability of capital. Physical resource covers raw materials, production capacity, and distribution channels provided by the firm (Grant, 1995). Finally, the managerial resource can be defined as upper-level people and the skills necessary for effectively running a business organization. Know-how in functional areas such as operations and marketing thereby fall in this category-

Clearly, an organisation's competitive advantage would need to be built on an organic combination of various types of resources it possesses (Chi, 1994). A reliance solely on any single type of resource may well work in the short term, but would be unlikely to generate sustainable competitive advantage in today's environment of intensified competition (Barney, 1991). For example, Reed and DeFillippi (1990) argued that physical assets alone do not help an organisation in building sustainable competitive advantage. It is, therefore, only natural that we see so many firms reaching out to other firms who hold resources complementary to their own. According to Harrison et al. (1991), valuable synergy is often created by combining different (or complementary) rather than similar (or supplementary) resources. The collaboration making process can thus be viewed in part as a process of seeking complementary resources. In this sense, the type of resource that organisations contribute
constitute a key dimension in understanding their orientations and objectives in prospective collaborations.

1.7.3 Risk-based View of Strategic Collaborations:

Risk is a significant factor in strategic management, since strategic decision making is inevitably concerned with assessing odds for successful performance (Baird & Thomas, 1985; March & Shapira, 1987). According to Thompson (1967), the control of uncertainties and risks in one's environment forms the essence of management. Risk sharing or risk controlling have been proposed in other studies (e.g., Kogut, 1988) as important justifications for joining strategic collaborations. For instance, many researchers identified risk control and risk reduction in R & D as a key rationale for R & D-related alliances (Gulati, 1995; Osborn & Baughn, 1990; Teece, 1992). Others have referred to risk reduction in investments as a stimulus for strategic collaborations (Hagedoorn, 1993).

In the process of strategic collaboration, risk considerations are obviously crucial (Brouthers, Brouthers & Wilkinson, 1995; Nueno & Oosterveld, 1988). How much ever crucial as they are, risk considerations are yet to receive adequate attention in the literature (Littler & Leverick, 1995). Traditionally, risk has been defined as either unanticipated variation or negative variation only. Ring and Van de Ven (1994) have suggested that in the alliance structuring process the partners are faced with two sets of risk: those "regarding future states of nature" and those regarding cooperation.

According to Das & Teng (1996b) there are two distinctive and equally important types of risk in a strategic collaboration / alliance viz., relational risk and performance risk. Relational risk is concerned with cooperative relationships, or the probability that the partner
does not comply with the spirit of cooperation. Opportunistic behavior of the partners is a typical source of relational risk. On the other hand, performance risk refers to the probability that intended strategic goals of an alliance may not be achieved, even though cooperation between the partners is satisfactory. According to Miller (1992) the concept "risk" often refers to factors "either external or internal to the organisation that impact on the risk experienced by the organisation," i.e., the sources of risk. In this light, relational risk and performance risk differ in terms of their sources: the first arising from organisation-organisation interaction, and the latter from organisation-environment interaction. Since these two sources represent different realms, they offer two independent types of risk. Whatever damage is caused by sub-optimal cooperation is attributable to relational risk, and whatever losses are caused by firm incompetencies and market uncertainties are ascribable to performance risk.

Thus, the way we define relational risk and performance risk excludes systematic interactive contamination between them, i.e., the level of one type of risk would not significantly correlate with that of the other. While in certain cases performance risk may contribute to relational risk, in other cases a high level of performance risk may create a sense of crisis and mitigate relational risk. Thus, although there may be situations in which the two types of risk seem to be related or dependent, they are not so in actuality. For example, in R & D alliances, both relational risk and performance risk tend to be high (Osborn & Baughn, 1990). However, just because there happens to be a common factor, such as R & D activities, that contribute to both types of risk, the independence of the two risks is not disproved.
1.7.4 Technology based Strategic Collaboration:

Technology refers to the expertise pertinent to the product, and is a key productive resource of an organisation. It is not easy to copy the technology belonging to other organisations, not only because it is duly safeguarded (technically), but also because it is usually protected by the patent system. The patent system ensures the organisation's exclusive usage of certain types of technology for a specified period of time. Thus, to have access to technological resource owned by other organisations becomes one of the most logical motives for entering into strategic collaborations (Hagedoorn, 1993). At the other end, those who possess technological resource may lack other needed resources, such as capital or distribution channels, to exploit their technological advantage. The point to bear in mind is that a collaboration does not mean a free transfer of technology. Rather, it refers to either a planned access to technology (so that joint objectives can be achieved, such as in joint ventures), or the sale of technology for a limited term (such as in licensing).

When an organisation provides technological resource but does not trust the goodwill of its partner, it will be concerned with protecting its technology. Thus, technology security becomes the firm's motive in the collaboration. Due to the nature of cooperation, it is usually difficult to protect technology and know-how (Osborn & Baughn, 1990). Yoshino and Rangan (1995) have described a collaboration between a U.S. and a Taiwanese firm. After secretly collecting considerable technological information from its U.S. partner in their two-year collaboration, the Taiwanese organisation entered the U.S. market and became a direct competitor. Having learnt a lesson, the U.S. organisation later formed another collaboration with an Asian partner, this time with explicit clauses to safeguard its
technology. For those who provide technology for collaboration, such a scenario is a nightmare. Hamel et al. (1989) have urged organisations in such situations to "develop safeguards against unintended, informal transfer of information."

When an organisation contributes its technology in the collaboration, the scenario is with high performance risk. In this case, the partners trust each other but are concerned about the riskiness of the venture. Therefore, the orientation of the partner with technology is to enhance the utility, or usefulness, of its technology, so that the venture can succeed. The term "utility" carries two meanings. First, it refers to the usefulness of the technology itself. Since technology is what the partner contributes, the first thing it can do to control high performance risk is to improve its technological usefulness. For many emerging technologies, setting high design standards is crucial for the future of the technology (Lei & Slocum, 1991). In industries related to the information superhighway, many American firms reach out to major Japanese firms in order to surround themselves "with an alliance of people who are world-class standard setters" (Armstrong & Holyoke, 1994). In the second sense, technological utility refers to the usefulness of the technology to the organisation, i.e., the economic returns from the technology. Hence, the organisation has to increase the output from the technology by making it accessible to more partners. The organisation can try to either reap increased benefits from the technology, or better control the performance risk through a portfolio of partnerships.

Since the orientation of the organisation is toward improving the "utility" of its technology, the specific objective of the organisation is to license the technology to as many partners as possible. Indeed, empirical studies show that licensing is preferable when the
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performance risk is high, since only then can the organisation avoid heavy involvement (Contractor, 1984). Extensive licensing seems to be an option which satisfies both the rationales that have been mentioned. First, licensing to many partners allows the organisation to reach an early standardization of design (Lei & Slocum, 1991). It helps control the pace of industry evolution. The organisation is able to capitalize on its technological innovation fast (Lei & Slocum, 1991), especially when there is still a lot of performance risk. Also, licensing controls high performance risk, because the firm avoids putting all its technological eggs in one alliance basket. Indeed, organisations have realized that licensing and franchising represent a long-run market solution to risk diversification problems (Martin, 1988).

1.7.5 The Fourth Dimension:

The present three dimensions viz., resource, technology and risk are relevant in the context of old economy organisations. For the purpose of studying the new economy or the digital economy there is a strong need for a fourth dimension, i.e., outsourcing, as the basis for collaboration.

The information technology paradigm has brought about change in the way organisations collaborate and work-together in achieving their ultimate objectives. There has been a major paradigm shift in the information technology collaborations paradigm from single organisation based technology development to that of multi-organisation collaboration since late 1980’s. The present digital economy paradigm operates in inter-organisational collaborations and the rapid pace of technology development is ascribed to this phenomenon of multi-organisation collaborations. Collaborations have reached a stage

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where IT organisations view collaboration as a key-factor for survival in general and success in specific. The present technology paradigm is largely shaped by high degree of specialisation focusing on core competence. The following Table No 1.1 depicts the difference between the old and new technology paradigms:

Table No 1.1: Difference between the old and new technology paradigms

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<thead>
<tr>
<th>Technology Factors</th>
<th>Old Technology Paradigm</th>
<th>New Technology Paradigm</th>
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<tbody>
<tr>
<td>Nature</td>
<td>Fundamental</td>
<td>Application</td>
</tr>
<tr>
<td>Development</td>
<td>Incremental</td>
<td>Radical</td>
</tr>
<tr>
<td>Scope</td>
<td>Limited &amp; restricted</td>
<td>Unlimited &amp; Wide</td>
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<tr>
<td>Pace</td>
<td>Slow</td>
<td>Fast</td>
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<tr>
<td>Collaboration basis</td>
<td>Resources, Technology &amp; Risk</td>
<td>and Outsourcing</td>
</tr>
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1.8 What is Outsourcing

The concept of "Outsourcing" has been widely used in the recent past and especially in the Information Technology industry. Organisations have started using outsourcing as a collaborative business strategy for competitive advantage. But there are hardly any research studies done in the area of outsourcing in general and in information technology industry in specific. There are some studies done by Leung (1992) Northfield (1992) Kilby (1993), Lacity & Hirschheim (1995), Worthington (1997), Kaganoff (1998), Houghton (2000), etc.

Outsourcing is essentially a 'how' rather than a 'what' term. It describes how IT services are obtained; not what the services are (Houghton, 2000). Outsourcing has been defined as: "A contractual relationship where an external organisation takes responsibility for performing all or part of an agency's Information Technology functions. This can involve a partial or complete transfer of staff and/or resources" (Kilby, 1993).
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Outsourcing is also defined as "an arrangement whereby a third party provider assumes responsibility for performing information systems functions at a pre-determined price and according to predetermined performance criteria" (Northfield, 1992). Outsourcing is the strategic use of outside resources to perform activities traditionally handled by internal staff and resources. Outsourcing is a strategy by which an organisation contracts out major functions to specialised and efficient service provider organisations who become valued business collaborators (Kaganoff, 1998).

Organisations have been collaborating in one form or other to level-off peaks and surplus in their workload and thus have formed long-term relationships with firms whose capabilities complement or supplement their own. Organisations have always looked for access to specialised resources to help them with tasks that would otherwise be beyond their individual reach, whether they be buildings, technology, people or any other resource. However the difference between simple "subcontracting" and "outsourcing", is that the latter involves the most efficient restructuring of particular business activities by utilising external partnerships with the required core competencies (Kaganoff, 1998). A closed look at the above definitions brings about three significant features or aspects of outsourcing, namely:

- size and duration of contract;
- transfer of assets or resources; and
- degree of responsibilities.

In its present usage outsourcing implies a greater level of handing over ownership and/or managerial control than has hitherto been the case (Leung, 1992). Thus, there are
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differences between outsourcing and other previously used terms such as - contracting out, sub-contracting, leasing out, etc. Also outsourcing is distinguished from the in-house provision of services and in-house provision means that the people who deliver the IT goods or services are normally employees of the organisation.

1.8.1 Reasons for Outsourcing

Organisations have been collaborating for outsourcing and each organisation has its own reasons for outsourcing. There are some studies that focused on the reasons for collaboration in general and with reference to information technology in specific and the reasons include - to reduce and control operating costs (Outsourcing Institute 2000 & 2001; Dave 2001; Worthington 1997; Whitehorse 1995), to improve company focus (Outsourcing Institute 2000 & 2001; Dave 2001; Worthington 1997; Whitehorse 1995), to gain access to world-class capabilities (Outsourcing Institute 2000 & 2001; Dave 2001), to free internal resources for other purposes (Outsourcing Institute 2000 & 2001; Dave 2001), as resources are not available internally (Outsourcing Institute 2000 & 2001), to accelerate reengineering benefits (Outsourcing Institute 2000; Dave 2001), function difficult to manage/out of control (Outsourcing Institute 2000; Dave 2001), to make capital funds available (Outsourcing Institute 2000), to share risks (Outsourcing Institute 2000; Dave 2001), to infuse cash (Outsourcing Institute 2000), to have access to skill (Worthington 1997; Whitehorse 1995), to have access to technology (Worthington 1997; Whitehorse 1995), for flexibility (Worthington 1997; Whitehorse 1995), and for accountability (Whitehorse 1995).

All these reasons can be classified in to the following categories:
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Economic Reasons:

Reduce Costs: Organisations can save on operational expenditure by outsourcing and the vendor organisations can save through consolidation of operations, bulk purchases, and stronger bargaining position in the market.

Share Risks: Primarily organisations outsource to share financial risk - to minimize or to give up.

Cash infusion: The cash saving by outsourcing can be infused for other business functions.

Human Resource Reasons:

Free internal resources for other purposes: Organisations outsource their technology development tasks to deploy the internal resources for other works (like maintenance, back-up, trouble shooting, etc).

Resources are not available internally: Also organisations outsource when they don't have adequate resources to cater to the internal tasks.

Management Reasons:

Improve company focus: Outsourcing can allow organisations to focus on their core business functions so that they can improve their business focus.

Function difficult to manage: The organisations mainly outsource when they can not effectively handle certain business functions and when it becomes difficult for them to handle.

Flexibility: Maintaining the level of equipment and human resources required to cover workload peaks can leave an organisation with unproductive resources for a significant proportion of the time. Rather they can outsource the same to have enough flexibility.
Accountability: By outsourcing organisations can make vendors more accountable with focus on service quality, and a consequent quality improvement

Technical Reasons:

Access to Skill: Client organisations can gain access to the skills they require as and when they are required and can call on resources of the supplier for highly specialised skills and/or in unusual situations.

Access to Technology: Many organisations find keeping up with technical developments in computing and communications very difficult. Thus it is for organisations to outsource so that they can have access to state-of-the-art technology from their vendors or suppliers.

1.8.2 Advantages of Outsourcing

The principal benefit of and reason to outsource is that it allows a firm to focus its activities on its core competency (Petrie, 2000; EIU/AA, 1995). The provider firm brings a number of advantages to the performance of its task including access to state-of-the-art technology; economies of scale with regard to hardware, software, and personnel; and aggressive use of low-cost labor pools (Antonucci, Lordi, and Tucker, 1998; Petrie, 2000; EIU/AA, 1995).

The outsourcing firm focuses on broader business issues, or maintains a clearer strategic focus, while operational details are assumed by an outside expert (Petrie, 2000; EIU/AA, 1995). Outsourcing can deliver considerable savings on office space, general overhead, company cars, pensions, insurance and salaries (Petrie, 2000). Since it is their core competency, providers are more likely to remain abreast of technological innovations in their
field. The outsourcing firm then gains easier access to expertise and new technological developments (EIU/AA, 1995).

Providers can be more flexible with regard to workload than an in-house process; this can allow a firm to turn a fixed cost into a variable cost through outsourcing (Petrie, 2000). Providers are more inclined to be flexible because of their customer/supplier orientation, an orientation that may well be absent in an in-house arrangement (EIU/AA, 1995).

In a nutshell, outsourcing is thought to be beneficial because of economies of scale, improved access to new technology, and the flexibility inherent in the outsourcing relationship. By outsourcing, company administrators can structure the outsourcing contract so that a vendor bears the cost of bringing in new equipment and technology. In the same way, the organisation can bring new levels of expertise and business savvy onto its organisation through a vendor. An organisation can, in fact, gain access to higher-level capabilities in a variety of domains without having to hire someone on staff (a particular benefit for smaller organisations). Outsourcing may enable an organisation to gain better control over a function. By awarding a contract, an administrator can more directly link remuneration with quality and completion of a task. It is possible to contract out some of the support functions, enabling administrators to focus attention on more fundamental activities, thereby allowing them to do a better job.

Outsourcing permits organisations to take advantage of economies of scale achieved by vendors (which may be providing services for multiple organisations or in other sectors). And in cases where there is not a constant or consistent need for a service, the organisation does not have to keep staff on hand during periods when the service is not needed.
1.8.3 Disadvantages of Outsourcing

Much of the literature is fundamentally in favor of outsourcing, but several possible problems or concerns are discussed. The concern universally given the most weight is the possible damage to company morale from outsourcing (Petrie, 2000; Antonucci, Lordi, and Tucker, 1998; EIU/AA, 1995). If savings are to be realized, personnel from outsourced functions will be dismissed or transferred to the provider firm, and personnel in potentially outsourced functions will respond adversely. Outsourcing firms fear losses in other areas as well. The nature of outsourcing creates a dependence on the provider firm, with a consequent loss of independence (Petrie, 2000; Antonucci, Lordi, and Tucker, 1998).

The outsourced department is no longer readily available for use in management training, preventing the creation of easy familiarity with that function (Petrie, 2000; EIU/AA., 1995). A number of concerns relate to the nature of the outsourcing relationship. First, there is a concern that, over time, outsourcing providers will demand ever greater premiums (EIU/AA, 1995). Having abandoned the internal function, firms will have no choice but to pay these increased premiums. There is also a concern that the provider will not understand a firm’s core business needs sufficiently, or the specific demands of the business environment (Petrie, 2000; EIU/AA, 1995).

In opposition to the asserted flexibility advantage, there is a concern that contracts might actually decrease flexibility, and that provider personnel might be less responsive man internal staff (Antonucci, Lordi, and Tucker, 1998). Finally, there is a concern about lack of long-term vision or loyalty from providers, especially on a short-term contract (Petrie, 2000; Antonucci, Lordi, and Tucker, 1998). Some of the limitations associated with contracting out
relate to the level of expertise and staffing in the organisation, which influence the organisation's ability to manage a contract. Some of the concerns with contracting out are more difficult to write into a contract. Critics of outsourcing are concerned that outside vendors may not understand the culture and mission of a campus, two of the most important characteristics of a campus because of their influence on a student's (or professor's, or staff member's) experience at that institution. All of these phenomena can threaten the sense of community and identity on a campus (Thompson and Morgovsky, 1996).

1.8.4 Collaborative Outsourcing

Sixty-five percent of the organisations that have been interviewed by Accenture (Accenture, 2001) engage in collaborative relationships with outsource business partners to create high-performance support operations that keep pace with industry best practice. As a result, outsourcing benefits have multiplied. Companies now report cost savings that average 50 percent over ten years, as opposed to an average of 20 percent savings reported in the mid 1990s. Furthermore, they gain access to competitive skills, improve service levels, and increase their ability to respond to changing business needs.
Table 1.2 The difference between Conventional and Collaborative Outsourcing:

<table>
<thead>
<tr>
<th></th>
<th>Conventional Outsourcing</th>
<th>Collaborative Outsourcing</th>
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<tbody>
<tr>
<td><strong>Objective</strong></td>
<td>Hand off support function to specialist provider to cut costs and focus managers on core issues</td>
<td>Upgrade non-core processes to cut expenses and provide flexibility to respond to changing business needs</td>
</tr>
<tr>
<td><strong>Partner Role</strong></td>
<td>Run Support Function</td>
<td>Re-engineer and run non-core processes</td>
</tr>
<tr>
<td><strong>Approach</strong></td>
<td>Standardized Services&lt;br&gt;Transaction-based, fee for service pricing&lt;br&gt;Narrow scale and scope of services</td>
<td>Flexible, tailored service&lt;br&gt;Output-based, gain share pricing&lt;br&gt;Servicing scaled to meet changing business needs</td>
</tr>
<tr>
<td><strong>Typical Benefits</strong></td>
<td>20-50% cost savings&lt;br&gt;Access to best practices&lt;br&gt;Improved career opportunities&lt;br&gt;Improved management focus</td>
<td>50% cost savings&lt;br&gt;Access to competitive skills&lt;br&gt;Improved career opportunities&lt;br&gt;Improved management focus</td>
</tr>
<tr>
<td><strong>Inputs</strong></td>
<td>Same, consistent service level&lt;br&gt;Shared financial risk</td>
<td>Higher, consistent service level&lt;br&gt;Improved flexibility, speed&lt;br&gt;Share operating risk</td>
</tr>
<tr>
<td><strong>Outputs</strong></td>
<td></td>
<td></td>
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From the above case studies one can identify the advantages of Collaborative outsourcing as follows:

- Step-change improvement in enterprise-level performance
- Reduced time-to-market
- Shared risk
- Increased innovation through access to world-class skills, resources and industry knowledge
- Enhanced core capabilities
- Strengthened competitive positioning
1.9 Organisational Learning

Considerable amount of research has been carried out on the subject of organisational learning. The following are some of the important definitions - "the process by which knowledge about action-outcome relationships and the effects of the environment on these relationships is developed" (Duncan & Weiss, 1978). "The development of insights, knowledge, and associations between past actions, the effectiveness of those actions, and future actions" (Fiol & Lyles, 1985). "The encoding of inferences from history into routines that guide behavior" (Levitt & March, 1988). "The continual expansion of the organization's capacity to create its future" (Senge, 1990b). "The acquisition of knowledge by any of its units that it recognizes as potentially useful" (Huber, 1991). "The skill of creating, acquiring, and transferring knowledge, and of modifying its behavior to reflect new knowledge and insights" (Garvin, 1993).

There are different typologies of organizational learning theories that exist in the literature. According to Shrivastava (1983) there are four types of organizational learning perspectives: (i) the process of organizational adaptation, (ii) the process of sharing and changing assumptions, (iii) the development of an action-outcome knowledge base, and (iv) the institutionalization of experience. Argyris & Schon (1978b) identify six categories that are based on organizational definitions: organization as a group, as an agent, as a structure, as a system, as a culture, and as politics.

Organizational learning comprises both behavioral and cognitive processes. Fiol & Lyles (1985) find this distinction persisting within the literature and offer resolution by
exclusively defining lower-level learning, associations formed under repetition of past behaviors, and higher-level learning, the development of new rules and associations regarding new actions. They equate these definitions with Argyris and Schon's (1978a) single-loop learning, the process of error-and-correction when present norms, policies, or objectives are undisturbed, and double-loop learning, the process of error-and-correction involving their modification. Dodgson (1993) equates the two processes with Senge's (1990b) generative learning and adaptive learning, and with Gagne's (1994) verbal knowledge and cognitive strategy dimensions of individual learning, dimensions that Gagné, in turn, equates with Bloom's Taxonomy. Garvin (1993) also acknowledges these two elements, but views them as overlapping, rather than exclusive, processes of organizational learning.

Researchers disagree as to whether either change or effectiveness are requisite to organizational learning (Garvin, 1993). Some state that it need not increase effectiveness, since incorrect learning may occur (Huber, 1991); consider the 'competency traps' such as the QWERTY keyboard offered by Levitt & March (1988) or Argyris' skilled incompetence, the skill of protecting oneself from the threat and pain that come with learning while remaining incompetent and blinded to that incompetence (Kofman & Senge, 1993). Fiol & Lyles (1985), however, note a dozen articles that assume that learning improves performance and Garvin (1993) believes that most scholars agree. Organizational learning need not effect observable organizational change, since it may merely modify existing knowledge (Fiol & Lyles, 1985; Huber, 1991); i.e., organizational learning may be either kinetic or potential in nature. Conversely, organizational change does not infer organizational learning; some change is 'unreflective' (Fiol & Lyles, 1985) and some defensive adaptive behaviors require
no incremental learning (Hedberg, 1981). Others simply state that learning is not fully equitable with change in a more general fashion (Shrivastava, 1983). One might view Simon's programmed and nonprogrammed decisions (Pugh & Hickson, 1993) in similar fashion.

Researchers generally agree that organizational learning that does effect change involves systematic shock anticipated by tension, but differ regarding the constitution of that shock and tension. Sociologist Kurt Lewin states (1951) that organizational change is effected when a 'felt need for change' is first created, when an 'unfreezing' of behaviors is implemented. Chapman, Kennedy, Newell, and Brill (1956) studied radar defense operational teams under simulation and observed that their learning did not occur in smooth increments, but was typically preceded by a degree of stress. Cyert and March (1992) view the organizational adaptation event as the application of external shock to the organization's 'preexisting preferences of state' and its set of internal decision rules. Cangelosi and Dill (1965) view stimulating stress as definitional and note that organizational learning is sporadic rather than continuous. Shrivastava (1983) finds several studies that show that organizational adaptation occurs in an incremental progression of small adjustments moderated by intra-organizational conflicts and bureaucratic procedures. Fiol and Lyles (1985) state that there is considerable evidence to suggest that "some type of crisis is necessary to effect change under higher-level learning;" organizational myths or past success can predispose resistance and "require shocks, jolts, or crisis for ... adaptation to take place." They also state that the process of learning involves the creation and manipulation of [the] tension between constancy and change.
organizations often change through a sequence of small, frequent changes, claim that in order "to be effective, the design of learning organizations must recognize ... the extent to which the comprehension of history may involve ... abrupt rather than incremental changes."

March, Sproull, and Tamuz (1991) note that critical incidents in an organization's history assume a special role in organizational learning when "history is not generous with experience."

1.10 Theories of Organisational Learning:

The importance of information assets to network organizations (Drucker, 1998; Jarvenpaa, 1994 & Powell, 1990) raises important questions about managing information resources. Theories of organizational learning provide a framework by breaking information management into acquisition, distribution, interpretation and memory (Huber, 1991). The first two describe the processes of obtaining and sharing information respectively. Sharing is important not only for completeness of access but also for generating new information. Interpretation is the process by which shared information acquires meaning and becomes translated into shared maps, frames, or schema. Organizational memory describes the storage of information for ready access and future use.

More learning may then be said to occur when information is shared more broadly, when more numerous and varied interpretations are developed, when different organizational members comprehend each other's interpretations - even if their own interpretations differ, and when latent information is recognized as potentially useful and stored. More learning does not necessarily imply a larger organizational action set, however, since this can add constraints to behavior as well as new options. In monitoring itself, an
organization can also engage in single-loop learning by successively comparing itself to its governing policies and adjusting for mismatches, or it can engage in double-loop learning by examining and changing its governing values (Argyris, 1978).

The flexibility of network organization in adding and discharging members creates several organizational learning problems. One is the problem of diffusing existing information and interpretation to joining members. Another is the problem of maintaining organizational history and experience in-house when members leave (Jarvenpaa, 1994). In highly unstable environments, members may welcome newly shared information but may have little incentive to relinquish their private sources of value. Yet, in fast-changing and competitive environments, organizations may have few alternatives to finding and sharing with partners. Vicarious learning and mimicry can mean entering an occupied niche while learning through experience can mean waiting longer than the opportunity lasts (Huber, 1991). Rather, organizations can network or increase their store of knowledge by grafting on experts. As the need for and rate of knowledge assimilation increases, grafting becomes an attractive means of organizational learning (Drucker, 1998 & Huber, 1991). It can be both "faster than acquisition through experience and more complete than acquisition through imitation" (Drucker, 1998). There is fairly strong evidence, for example, that biotechnology firms learn by networking (Powell, 1993). Sociological theories on organizational learning thus offer a possible explanation for the emergence of network organization.

1.11 Learning Through Networks:

The main argument of Powell and others (1996) is that, when knowledge is broadly distributed and brings a competitive advantage, the locus of innovation is found in a
network of interorganisational relationship. In industries in which know-how is critical, companies must have expertise at both in-house research and cooperative research with such external partners as university departments, research centres and skilled competitors. A firm with a greater capacity to learn is adept at both internal and external R&D, thus enabling it to contribute more to a collaboration as well as learn more extensively from such participation. Internal capability and external collaboration are not substitutes for one another, but complementary. Internal capability is indispensable in evaluating research done outside, while external collaboration provides access to information and resources that cannot be generated internally. A network serves as a locus of innovation because it provides timely access to knowledge and resources that are otherwise unavailable, while also testing internal expertise and learning capabilities.

Powell's (1996) concept of networks of learning highlights two key observations: (1) Interorganisational collaborations are not simply a means to compensate for the lack of internal skills, (2) nor should they be viewed as a series of discrete transactions. A firm's values and ability as a collaborator are related to its internal assets, but at the same time, collaboration further develops and strengthens those internal competencies. The development of cooperative routines goes beyond simply learning how to maintain a large number of ties. Firms must learn how to transfer knowledge across alliances and locate themselves in those network positions that enable them to keep pace with the most promising scientific or technological developments.

Knowledge facilitates the use of knowledge. What can be learned is crucially affected by what is already known. Knowledge also requires other knowledge. When the sources of
expertise are disparate, collaborative R&D opens an organisation's eyes to the need for accessing ideas and information from a variety of sources, to exploit the research findings in a commercial context.

1.12 Collaboration and Organisational Learning:

The present-day science is growing at a fast pace, hand in glove with technology development. The actors in the technological field in order to survive have to acquire knowledge and thus are being compelled to learn continuously. Modern organisations only learn through participating in the knowledge pool i.e., collaboration. When there is a regime of rapid technological development, research breakthroughs are so broadly distributed that no single firm has all the internal capabilities necessary for successes (Powell, 1996). This is the trend in most of the industrialised countries and most of them have proved to be a success.

Powell and his associates (1996), after a survey of organisational literature, have come out with two postulates, rather two different views about collaboration and learning:

(1) The choice to pool resources with another organisation depends on calculations involving risk versus return. Firms turn to collaborate to acquire resources and skills they cannot produce internally, as long as the hazards of cooperation can be withstood to a tolerable level.

(2) What is learned is profoundly linked to the conditions under which it is learned. Knowledge creation occurs in the context of a community, one that is fluid and evolving rather than tightly bound or static. In this aspect Powell (1990) says that the canonical formal organisations, with their bureaucratic rigidities, are poor vehicles for learning.
According to him, sources of innovation do not reside exclusively inside firms; instead, they are commonly found in the interstices between firms, universities, research laboratories, suppliers and customers. What Powell says mostly applies to the western nations which reached advanced level of industrialisation. Here the question is whether the same can be said of the technology development in India? If one analyses the nature of restructuring taking place in the Indian R&D scenario, it can be observed that characteristics of Indian R&D organisations are slowly moving from the first postulate (proposed by Powell and his associates) towards the second. That is to say the Indian R&D organisations are coming out of their rigid bureaucratic structures and are heading towards collaborations. Most of the organisations have realised the fact that external ties are the key to success and for that they should build their internal capabilities before they go for a tie-up. But this is only a tip of the ice berg. Most of the firms are going for external collaborations to acquire resources and skills they cannot produce internally.

As far as organisational learning is concerned the Indian organisations are much behind the western organisations though the country has the largest number of S&T personnel in the world. The Indian organisations are still in the stage of infighting and trying to overcome the internal competition rather than competing in the international markets. The need of the hour for the Indian R&D organisations is knowledge gaining through learning and a vertical shift from 'exploitation' to 'exploration'. March (1991) distinguishes between exploitation and exploration in his discussion on learning. According to him, exploitation is the refinement and extension of existing competences, technologies and paradigms and exploration is experimentation with new alternatives. And he says exploration
is "the only way to finish first" though it may work out cosdy. Organisational learning is both a function of access to knowledge and the capabilities for utilising and building on such knowledge. Powell (1996) argues that organisational arrangements that provide access to knowledge quickly and reliably produce competitive advantage. Research breakthroughs demand a range of intellectual and scientific skills that far exceed the capabilities of any single organisation. To illustrate further they quote two best examples of discoveries in biotechnology: The development of an animal model for Alzheimer's disease appeared in a report (Nature, Feb.9, 1995) co-authored by 34 scientists affiliated with two new biotech companies, one established pharmaceutical firm, a leading research university, a federal research laboratory, and a non-profit research institute. Similarly, a publication identifying a strong candidate for the gene determining susceptibility to breast and ovarian cancer (Science, Oct. 7, 1994) featured 45 coauthors drawn from a biotech firm, a U.S. medical school, a Canadian medical school, an established pharmaceutical company, and a government research laboratory. Here the significant point is that more than the number of coauthors are the diversity of sources of innovation and the wide range of different organisations involved in these breakthrough innovations.

1.13 Interorganisational Collaboration and Software Development:

There has been a growing change in the kind of collaborations between industries in the recent past. Today, companies in a wide range of industries are executing nearly every step in the production process, from discovery to distribution, through some form of external collaboration (Powell, 1996). An important observation made in this aspect is that
the R&D intensity or level of technological sophistication of industries is positively correlated with the intensity and number of alliances in those sectors.

Technological change can be broadly classified into two forms:

1. Incrementalism: Advances built on existing technologies and this process goes on.
2. Radicalism: New discoveries or innovations create technological discontinuities or radical breaks from previously dominant methods.

In the first case the existing firms enjoy the benefits whereas in the second case new organisational structures and practices emerge to exploit the new discoveries. Therefore, one of the objectives of the present study is to examine the organisational arrangements that have arisen in response to the technological possibilities generated by the information technology. The purpose is to map the network structure of this emerging industry and explain the purposes served by the extensive connections that typify the field.

1.14 Knowledge Production in Information Technology Industry: A Paradigm Shift

Information Technology industry has experienced a paradigm shift in the recent past. Earlier on, the software companies were more dependent on self-learning and were self-reliant for their technology development. Because of this approach, they had relatively slow growth, limited knowledge and thus restricted technology development. In order to acquire new knowledge and skills to develop frontier technologies and its application the IT companies have begun sourcing out their avenues through collaborations. Today every company has one or the other kind of collaboration with other companies for their
knowledge acquisition. The synergy not only helps them to keep themselves abreast of new developments in technology but also has contributed to their innovative capabilities.

Earlier on in Information Technology industry knowledge has been an individual's intellectual property. Where as in the modern era knowledge is considered as an organisational asset and thus comprehensive organisational learning has become an imperative for organisational success. A more compact definition of organisational learning was given by Fiol and Lyles (1985) as 'the development of insights, knowledge, and associations between past actions, the effectiveness of those actions, and future actions'. In the modern world, technology development and organisational learning are found to be interrelated processes and these are improved through collaborations.

1.15 Statement of the Problem

In recent times India has emerged as a leading market player in the field of Information Technology (IT) and especially in the software sector. Much of the success can be ascribed to the collaborations that the Indian companies have with the companies in US & Europe. (see Figure 1.2 for a diagram on collaboration requirements of a software organisation)

**Figure 1.2: Collaboration Requirements of a Software Development Organisation**
The very fact that the industry is able to survive and develop at a significant rate implies that collaborations are working. Some of the major factors that account for the success of the Indian IT companies are - fast learning curve, availability of qualified manpower and adaptability to the emerging situations. When collaboration is the key issue and possibly the strategic factor for the success of software industry, it is essential that we study the organisational collaboration in detail - the concept, its nature and scope, empirical analysis of basis for collaboration, underlying factors contributing and hindering collaboration and thus build a model for collaboration. Also it is important to look into the relationship among the other key factors involved in collaboration and thus examine the relationship between interorganisational collaboration and organisational learning. (see Figure 1.2 for a "Non-linear model of interorganisational collaboration, organisational
learning and software development") For the purpose of this study it is assumed that interorganisational collaboration and organisational learning are directly proportional to each other and a change in one will affect the other and vice-versa.

In an organisational context collaboration can only be a beginning or in some cases collaboration might be a means to achieve the ends. Organisational learning facilitates the process of collaboration, that is, it is a means to achieve the end goals. The end goal in any technology based company is technology development itself. So it is also very important to study technology development - the concept, the nature and scope, the development of different types of technologies and their relationship with other organisational factors like collaboration and organisational learning. Thus it can be hypothesised that interorganisational collaboration and organisational learning are directly proportional to each other and in turn software development is positively related to and influenced by interorganisational collaboration and organisational learning.
Figure 1.3: Non-linear Model of Interorganisational Collaboration, Organisational Learning and Software Development
1.16 Hypothesis:

Given the nature of information technology where knowledge is widely distributed, high degree of specialization and collaboration is the order of the day and organizational learning is inevitable - interorganisational collaboration and organizational learning are directly proportional to each other and also software development is positively related and influenced by interorganisational collaboration and organizational learning.

Hypothesis 1: There is a positive correlation between inter-organisational collaboration and organisational learning

Hypothesis 2: A related hypothesis is that software development is positively related and influenced by inter-organisational collaboration and organisational learning
1.17 Objectives:

- To trace the nature of technology development in the software companies in Hyderabad and examine the organisational structures and arrangements that have arisen in response to it.
- To explore the nature, scope & characteristics of different kinds of collaborations in software industry.
- To identify the various methods of organisational learning adopted by the software companies and highlight the various factors that have contributed to collaborative learning.
- To establish the relationship between organisational learning and organisational collaborations and their impact on software development.
Chapter 1: Introduction

1.18 Scheme of Presentation:

The thesis is divided into nine chapters.

Chapter I contains the introduction, the review of literature, statement of the problem, hypothesis and objectives.

Chapter II deals with methodology discussing the sampling plan and plan of analysis.

Chapter III gives a brief introduction to Information Technology (IT) and concepts, origin and growth of Information Technology in India, and a concise history of the Software industry in India.

Chapter IV deals with the organisational profile of the sample companies.

Chapter V describes the collaboration patterns of the companies.

Chapter VI deals with the organisational learning patterns.

Chapter VII describes the factors of time, effort and size in software development.

Chapter VIII Testing of Hypothesis with quantitative data analysis

Chapter IX Conclusions

Bibliography